

RAJ SURYANARAYANAN (SURY), Ph.D.
Curriculum Vitae

Professor and William & Mildred Peters Endowed Chair, Department of Pharmaceutics
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EDUCATION

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| 12/89–3/90 | Visiting Research Scholar (Laboratory of Dr. Peter York), Department of Pharmaceutical Technology, School of Pharmacy, University of Bradford, Bradford, UK. |
| 1985 | Ph.D. in Pharmaceutics, Faculty of Pharmaceutical Sciences, University of British Columbia Vancouver, Canada.
<u>Thesis</u> : Studies on the Crystallinity and Phase Transitions of Calcium Gluceptate |
| 1981 | M.Sc. in Pharmaceutics, Faculty of Pharmaceutical Sciences, University of British Columbia Vancouver, Canada.
<u>Thesis</u> : The Stability of Calcium Glucoheptonate Solutions |
| 1978 | M.Pharm., Banaras Hindu University, Varanasi, India.
<u>Thesis</u> : Studies on the Stability of Indomethacin in Solution and Development of Some Suspension Formulations |
| 1976 | B.Pharm., Banaras Hindu University, Varanasi, India. |

PROFESSIONAL EXPERIENCE

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| 2024– | Head, Department of Pharmaceutics, College of Pharmacy, University of Minnesota, Minneapolis, MN. |
| 2006– | William and Mildred Peters Endowed Chair, Department of Pharmaceutics, College of Pharmacy, University of Minnesota, Minneapolis, MN. |
| 1999– | Professor, College of Pharmacy, University of Minnesota, Minneapolis, MN. |
| 1994–1998; | Director of Graduate Studies, Pharmaceutics Graduate Program, College of Pharmacy, |
| 2023– 2024 | University of Minnesota, Minneapolis, MN. |
| 1992–1999 | Associate Professor, Department of Pharmaceutics, College of Pharmacy, University of Minnesota. |
| 1985–1992 | Assistant Professor, Department of Pharmaceutics, College of Pharmacy, University of Minnesota. |
| 1982–83; 1979 | Teaching Assistant, University of British Columbia, Vancouver, Canada. |
| 1979 | Supervisor, Injection Manufacturing Department, Hoffman-La Roche Limited, Mumbai, India. |
| 1978 | Management Trainee, Indian Drugs and Pharmaceuticals Limited, Rishikesh, India. |

FELLOWSHIPS AND AWARDS

Year	Award
1976	Aruna & Malaviya and BHU Gold Medals awarded by Banaras Hindu University, Varanasi, India, for securing the first rank in the Bachelor of Pharmacy degree program.
1976	I.D.M.A. - G.P. Nair Award presented by the Indian Drug Manufacturers Association, Bombay, India.

Year	Award
1979–1982	Graduate Research in Engineering and Technology Award of Science Council of British Columbia, Canada.
1980	Novo Group Scholarship awarded by Stanley Drug Products, North Vancouver, British Columbia, Canada.
1983	Summer University Graduate Fellowship, University of British Columbia.
1983–1985	University Graduate Fellowship (Doctoral), University of British Columbia.
1986	Rho Chi National Pharmacy Honor Society.
1986, 1987	Outstanding Young Man of America.
1987	Young Investigator Award, American Association of Colleges of Pharmacy.
1988	Merck Faculty Development Award, Merck Sharp & Dohme Research Laboratories, Rahway, NJ.
1990	Young Investigator Award, Lilly Research Laboratories, Indianapolis, IN.
1991	Gordon L. Starr Faculty/Staff Outstanding Contribution Award from the Minnesota Student Association, University of Minnesota, Minneapolis, MN.
1992	Who's Who in the Midwest, 23rd ed., Marquis.
1992	American Men and Women of Science, 18th ed., Bowker.
1992	Morse-Alumni Award for Outstanding Contributions to Undergraduate Education awarded by the Senate Committee on Educational Policy, University of Minnesota, Minneapolis, MN.
1993	Men of Achievement, International Biographical Centre, Cambridge, UK Nominated International Man of the Year.
1993–1994	Participant in the Bush Faculty Development Program on Excellence and Diversity in Teaching.
1994	Dictionary of International Biography, International Biographical Centre, Cambridge, UK
1995	Best Poster Paper Award, XRD Poster Session, 1995 Denver X-ray Conference, Colorado Springs, CO.
1996	“Morse Alumni Distinguished Teaching Professor in Pharmaceutics” awarded by the University Senate and the Board of Regents of the University of Minnesota.
1997	Asia's Who's Who of Men and Women of Achievement, Vol. X, Rifacimento International, New Delhi, India.
1997 & 1998	Teacher of the Quarter (Spring quarter), University of Minnesota.
1999	Inducted into the Academy of Distinguished Teachers, University of Minnesota.
2000, 2001,	Teacher of the Semester (Spring semester), University of Minnesota.
2003, 2005, 2006	
2000	Educator of the Year
2000	Best Poster presentation, Society for Low Temperature Biology in association with the Society for Cryobiology, Boston, MA.
2000	Best Podium presentation, Society for Low Temperature Biology in association with the Society for Cryobiology, Boston, MA.
2000	Elected to the ‘Excipients: Test Methods Expert Committee’ by the United States Pharmacopeia Council of Experts for the 2000–2005 revision cycle.
2002	Fellow, American Association of Pharmaceutical Scientists
2005	Award for Outstanding Contributions to Graduate and Professional Education recognizing contributions to post-baccalaureate, graduate, and professional education.
2007	Distinguished Alumnus Award 2007, Banaras Hindu University, Department of Pharmaceutics, Institute of Technology, Varanasi, India.
2010	American Association of Pharmaceutical Scientists (AAPS) 2010 Outstanding Educator Award, recognizing excellence in education in the technologies related to pharmaceuticals.
2012	AAPS Outstanding Manuscript Award in Analysis and Pharmaceutical Quality sponsored by Celgene, received for manuscript coauthored with Kapildev Arora and Nitin Tayade.
2013	PhRMA (Pharmaceutical Research and Manufacturers of America) Foundation Award in Excellence
2013	AAPS David J.W. Grant Research Achievement Award in Physical Pharmacy
2014	Associate Editor, Molecular Pharmaceutics (ACS)
2015	Ralph Shangraw Memorial Award from the International Pharmaceutical Excipients Council of the Americas (IPEC-Americas) Foundation

Year	Award
2019	Elected Teacher of the Semester (Spring Semester) by the PharmD Class of 2022
2021	Elected Teacher of the Semester (Spring Semester) by the PharmD Class of 2024
2021	Michael J. Pikal Distinguished Scholar Award in Pharmaceutical Processing, awarded by the National Institute for Pharmaceutical Technology & Education (NIPTE)
2022	Elected Teacher of the Semester (Spring Semester) by the PharmD Class of 2025
2023	The Raj Suryanarayanan (Sury) Dedicated Issue of JPharmSci® in recognition as one of the 'True Giants' in the pharmaceutical sciences. The January 2023 issue of the <i>Journal of Pharmaceutical Sciences</i> was dedicated in my honor.

Selected Advisee, Student & Postdoc Awards and Fellowships (since 2008)

Sisir Bhattacharya (Ph.D. 2008)

- AAPS Graduate Student Research Award in Physical Pharmacy and Biopharmaceutics (PPB), AAPS Annual Meeting, San Diego, CA, November 2007.

Paroma Chakravarty (Ph.D. 2010)

- AAPS Graduate Student Symposium Award in Manufacturing Science and Engineering (MSE), 2010 AAPS-FIP Meeting, New Orleans, LA, November 2010.

Prakash Sundaramurthi (Ph.D. 2010)

- AAPS Graduate Student Research Award in Physical Pharmacy and Biopharmaceutics (PPB), AAPS Annual Meeting, Los Angeles, CA, November 2009.
- AAPS Graduate Student Research Award, 2010 AAPS Meeting, New Orleans, LA, November 2010.

Kapildev Arora (postdoc 2009 – 2012)

- AAPS Outstanding Manuscript Award in Analysis and Pharmaceutical Quality (APQ) for the manuscript, "Unintended Water Mediated Cocrystal Formation in Carbamazepine and Aspirin Tablets," on which Dr. Raj Suryanarayanan was co-author.

Sunny Bhardwaj (Ph.D. 2012)

- AAPS Graduate Student Research Award in Analysis and Pharmaceutical Quality (APQ) AAPS Annual Meeting, New Orleans, LA, November 2010.
- AAPS Graduate Student Symposium Award in Analysis and Pharmaceutical Quality (APQ), 2010 AAPS-FIP Meeting, New Orleans, LA, November 2010.
- 2011 International Pharmaceutical Excipient Council (IPEC) Graduate Student Scholarship Award
- AAPS Graduate Student Research Award in Physical Pharmacy and Biopharmaceutics (PPB), 2012 AAPS Annual Meeting, Chicago, IL, October 2012.

Khushboo Kothari (Ph.D. 2014)

- Baxter Young Investigator Award, 2012
- 3M Fellowship in Science and Engineering, 2012
- AAPS Graduate Student Research Award in Analysis and Pharmaceutical Quality (APQ), AAPS Annual Meeting, Chicago, IL, October 2012.
- AAPS Graduate Student Research Award in Physical Pharmacy and Biopharmaceutics (PPB), AAPS Annual Meeting, San Antonio, TX, November 2013.
- AAiPS Research Award from the American Association of Indian Pharmaceutical Scientists, AAPS Annual Meeting, San Antonio, TX, November 2013.
- University of Minnesota Doctoral Dissertation Fellowship, 2013

Mehak Mehta (Ph.D. 2016)

- AAPS Graduate Student Research Award in Analysis and Pharmaceutical Quality (APQ), AAPS Annual Meeting, San Antonio, TX, November 2013.
- University of Minnesota Doctoral Dissertation Fellowship, 2014
- AAPS Graduate Student Research Award in Physical Pharmacy and Biopharmaceutics (PPB), AAPS Annual Meeting, San Diego, CA, November 2014.
- AAPS Best Poster Award in Analysis and Pharmaceutical Quality (APQ), AAPS Annual Meeting, San Diego, CA, November 2014.
- AAPS Graduate Student Research Award in Physical Pharmacy and Biopharmaceutics (PPB), 2015 AAPS Annual Meeting, Orlando, FL October 2015.

Year	Award
Pinal Mistry (Ph.D. 2016)	
	- AAPS Graduate Student Travelship Award in Physical Pharmacy and Biopharmaceutics (PPB), 2013 AAPS Annual Meeting, San Antonio, TX, November 2013. - AAPS Graduate Student Research Award in Analysis and Pharmaceutical Quality (APQ), AAPS Annual Meeting, San Diego, CA, November 2014. - IPEC Foundation Excipient Graduate Student Scholarship from the International Pharmaceutical Excipients Council, 2014 - AAPS Graduate Student Research Award in Physical Pharmacy and Biopharmaceutics (PPB), AAPS Annual Meeting, Orlando, FL, October 2015. 2015 AAPS Outstanding Manuscript Award in Physical Pharmacy and Biopharmaceutics (PPB) for the manuscript, "Role of the Strength of Drug–Polymer Interactions on the Molecular Mobility and Crystallization Inhibition in Ketoconazole Solid Dispersions," published in <i>Molecular Pharmaceutics</i>, on which Dr. Raj Suryanarayanan was co-author.
Michelle Fung (Ph.D. 2017)	
	- Ted Rowell Graduate Fellowship in basic pharmaceutical sciences for 2015-2016. - Pharmaceutical Research and Manufacturers of America (PhRMA) Foundation Pre-Doctoral Fellowship in Pharmaceutics (2015-2017). - AAPS Graduate Student Research Award in Analysis and Pharmaceutical Quality Section (APQ), AAPS Annual Meeting, Denver, CO, November 2016.
Sampada Koranne (Ph.D. 2018)	
	- Baxter Young Investigator Award, 2013 - AAPS Graduate Student Research Award in Analysis and Pharmaceutical Quality (APQ), AAPS Annual Meeting in Orlando, FL, October 2015. - AAPS Graduate Student Research Award in Formulation Design and Development (FDD), AAPS Annual Meeting, Denver, CO, November 2016. - Outstanding Poster Presentation Award at the Gordon Research Seminar on Preclinical Form and Formulation for Drug Discovery, Stoweflake Conference Center, Denver, CO, 2016. - IPEC Foundation 2017 Graduate Student Award for the project, "Mechanistic Insights into Excipient Induced Salt Disproportionation in Multi-Component Pharmaceutical Dosage Forms", AAPS Annual Meeting, San Diego, CA, November 2017.
Seema Thakral (Postdoc 2011 – 2015; Research Scholar 2015 – current)	
	2015 Deane K. Smith Fellowship from the International Center for Diffraction Data (ICDD) to attend the XRD Fundamentals of X-ray Powder Diffraction Clinic at the ICDD headquarters in Philadelphia, PA in June 2015. 2015 AAPS Outstanding Manuscript Award in Physical Pharmacy and Biopharmaceutics (PPB) for the manuscript, "Salt formation during freeze-drying – an approach to indomethacin dissolution", published in <i>Pharmaceutical Research</i>, on which Dr. Raj Suryanarayanan was co-author.
Kweku Amponsah-Efah (Ph.D. 2020)	
	2017 AAPS Graduate Student Research Award in Analysis and Pharmaceutical Quality (APQ), AAPS Annual Meeting, San Diego, CA, November 2017. 2018 IPEC Foundation Graduate Student Award 2019 Three-Minute Thesis Award and People's Choice Award
Navpreet Kaur (Ph.D. 2021)	
	2020 Robert L. Snyder Student Award from the International Centre for Diffraction Data (ICDD), to attend the 2020 Denver X-ray Conference (DXC), held virtually from August 3-7, 2020. 2020 Young Chemist Committee American Chemical Society Leadership Award (Atlanta, GA) 2020 IPEC Foundation Graduate Student Award 2020 Best Student Poster Award, Denver X-Ray Conference, August 2020 (virtual) 2020-2021 David J.W. and Marilyn J. Grant Fellowship in Physical Pharmacy, University of Minnesota 2020-2021 Rowell Graduate Student Fellowship, University of Minnesota 2021 Presidential Student Leadership Award (PSLSA 2021), University of Minnesota 2021 Ludo Frevel Award, International Centre of Drug Diffraction

Year	Award
Jayesh Sonje (Ph.D. 2022)	
	• 2021-2022 David J.W. Grant Fellowship • 2021 IPEC Foundation Graduate Student Awards presented at the AAPS PharmSci 360 Conference in Philadelphia, PA, Oct 17-20, 2021
Rahul Lalge (Ph.D. 2023)	
	• 2021 Robert L. Snyder Student Award, Denver X-ray Conference • 2021 IPEC Foundation Graduate Student Awards presented at the AAPS PharmSci 360 Conference in Philadelphia, PA, Oct 17-20, 2021
Jinghan Li (Ph.D. 2024)	
	• 2022 IPEC Foundation Graduate Student Awards presented at the AAPS PharmSci 360 Conference in Boston, MA, Oct 16-19, 2022 • Doctoral Dissertation Fellowship, Graduate School, The University of Minnesota, 2023.

PATENTS

1. R. Suryanarayanan, Quantitative analysis of the active tablet ingredient by powder X-ray diffractometry. U.S. Patent Number 4,991,191, February 1991.
2. R. Krishnamurthy, R. Suryanarayanan, X. Liao, Lyophilized formulation of a protein active agent. U.S. Patent Appl. Publ. (2007), 51pp.
3. G. Beilman, A. Wolf, R. Suryanarayanan, S. Thakral, Resuscitation composition and methods of making and using. US Patent Number 10,307,398 B2, June 2019.

PUBLICATIONS (refereed journals)

1. R. Suryanarayanan and A.G. Mitchell, Modified USP assay of calcium gluceptate. *J. Pharm. Sci.*, 70, 968 (1981).
2. R. Suryanarayanan and A.G. Mitchell, The precipitation of calcium gluceptate from aqueous solutions. *J. Pharm. Sci.*, 73, 78–82 (1984).
3. R. Suryanarayanan and A.G. Mitchell, Evaluation of two concepts of crystallinity using calcium gluceptate as a model compound. *Int. J. Pharm.*, 24, 1–17 (1985).
4. A.G. Mitchell and R. Suryanarayanan, Solubility of calcium gluceptate and the preparation of calcium gluceptate injection USP. *J. Parenteral Sci. Tech.*, 40, 48–51 (1986).
5. R. Suryanarayanan and A.G. Mitchell, Phase transitions of calcium gluceptate. *Int. J. Pharm.*, 32, 213–221 (1986).
6. R. Suryanarayanan, Determination of the relative amounts of anhydrous carbamazepine (C₁₅H₁₂N₂O) and carbamazepine dihydrate (C₁₅H₁₂N₂O·2H₂O) in a mixture by powder X-ray diffractometry. *Pharm. Res.*, 6, 1017–1024 (1989).
7. R. Suryanarayanan and T.S. Wiedmann, Quantitation of the relative amounts of anhydrous carbamazepine (C₁₅H₁₂N₂O) and carbamazepine dihydrate (C₁₅H₁₂N₂O·2H₂O) in a mixture by solid state NMR. *Pharm. Res.*, 7, 184–187 (1990).
8. R. Suryanarayanan, Determination of the relative amounts of α -carbamazepine and β -carbamazepine in a mixture by powder X-ray diffractometry. *Powder Diffraction*, 5, 155–159 (1990).
9. R. Suryanarayanan and C.S. Herman, Quantitative analysis of the active tablet ingredient by powder X-ray diffractometry. *Pharm. Res.*, 8, 393–399 (1991).
10. R. Suryanarayanan, Quantification of carbamazepine in tablets by powder X-ray diffractometry. *Advances in X-ray Analysis*, 34, 417–427 (1991).
11. A.K. Dash and R. Suryanarayanan, A sensitive liquid-chromatographic method for determination of tobramycin in pharmaceutical formulations. *J. Pharm. Biomed. Anal.*, 9, 237–245 (1991).
12. W.W.L. Young and R. Suryanarayanan, Kinetics of transition of anhydrous carbamazepine (C₁₅H₁₂N₂O) to carbamazepine dihydrate (C₁₅H₁₂N₂O·2H₂O) in aqueous suspensions. *J. Pharm. Sci.*, 89, 496–500 (1991).
13. A.K. Dash and R. Suryanarayanan, Solid-state properties of tobramycin. *Pharm. Res.*, 8, 1159–1165 (1991).

14. R. Suryanarayanan and C.S. Herman, Quantitative analysis of the active ingredient in a multi-component tablet formulation by powder X-ray diffractometry. *Int. J. Pharm.*, 77, 287–295 (1991).
15. R. Suryanarayanan, S. Venkatesh, L. Hodgins and P. Hanson, Determination of the physical state of salicylic acid in hydrogel formulations by X-ray diffractometry. *Int. J. Pharm.*, 78, 77–83 (1992).
16. S. Venkatesh, L. Hodgins, P. Hanson and R. Suryanarayanan, In vitro release of salicylic acid from hydrogel drug delivery systems *J. Controlled Release*, 18, 13–18 (1992).
17. P.J. Camarata, R. Suryanarayanan, D.A. Turner, R.G. Parker and T.J. Ebner, Sustained release of nerve growth factor from biodegradable polymer microspheres, *Neurosurgery*, 30, 313–319 (1992).
18. A.K. Dash and R. Suryanarayanan, An implantable dosage form for the treatment of bone infections, *Pharm. Res.*, 9, 993–1002 (1992).
19. R. Suryanarayanan, Q. Wu and Y.E. Rahman, Development of a suspension formulation of 1,2-dimethyl-3-hydroxy-pyrid-4-one (DMHP) for the treatment of iron overload, *Medical and Surgical Paediatrics*, G.J. Kontoghiorhies and V. Carnelli (Eds.), October, 1994.
20. S.P. Duddu, A. Khin-Khin, D.J.W. Grant and R. Suryanarayanan, A novel X-ray powder diffractometric method for studying the reaction between pseudoephedrine enantiomers, *J. Pharm. Sci.*, 86, 340–345 (1997).
21. N.V. Phadnis, R.K. Cavatur and R. Suryanarayanan, Identification of drugs in pharmaceutical dosage forms by X-ray powder diffractometry, *J. Pharm. Biomed. Anal.*, 15, 929–943 (1997).
22. N.V. Phadnis and R. Suryanarayanan, Simultaneous quantification of an enantiomer and the racemic compound of ibuprofen by X-ray powder diffractometry, *Pharm. Res.*, 14, 1176–1180 (1997).
23. J. Han and R. Suryanarayanan, Applications of pressure differential scanning calorimetry in the study of pharmaceutical hydrates. 1. Carbamazepine dihydrate, *Int. J. Pharm.*, 157, 209–218 (1997).
24. N.V. Phadnis and R. Suryanarayanan, Polymorphism in anhydrous theophylline – implications on the dissolution rate of theophylline tablets, *J. Pharm. Sci.*, 86, 1256–1263 (1997).
25. R.K. Cavatur and R. Suryanarayanan, Characterization of frozen aqueous solutions by low temperature X-ray powder diffractometry, *Pharm. Res.*, 15, 194–199 (1998).
26. J. Han, S. Gupte and R. Suryanarayanan, Applications of pressure differential scanning calorimetry in the study of pharmaceutical hydrates. 2. Ampicillin trihydrate, *Int. J. Pharm.*, 170, 63–72 (1998).
27. R.K. Cavatur and R. Suryanarayanan, Characterization of phase transitions during freeze-drying by in situ X-ray powder diffractometry, *Pharm. Dev. Tech.*, 3, 579–586 (1998).
28. J. Han and R. Suryanarayanan, Influence of environmental conditions on the kinetics and mechanism of dehydration of carbamazepine dihydrate, *Pharm. Dev. Tech.*, 3, 587–596 (1998).
29. J. Han and R. Suryanarayanan, A method for the rapid evaluation of the physical stability of pharmaceutical hydrates, *Thermochimica Acta*, 329, 163–170 (1999).
30. S. Rastogi, I. Zamansky, S. Roy, P. Tyle and R. Suryanarayanan, Solid-state phase transitions of AG337, an antitumor agent, *Pharm. Dev. Tech.*, 4, 623–632 (1999).
31. R. Surana and R. Suryanarayanan, Quantification of crystallinity in substantially amorphous pharmaceuticals and study of crystallization kinetics by XRD, *Powder Diffraction*, 15, 2–6 (2000).
32. Y. Li, J. Han, G.G.Z. Zhang, D.J.W. Grant and R. Suryanarayanan, In situ dehydration of carbamazepine dihydrate – a novel technique to prepare amorphous anhydrous carbamazepine, *Pharm. Dev. Tech.*, 5, 257–266 (2000).
33. S.S. Iyengar, N.V. Phadnis and R. Suryanarayanan, Quantitative analyses of complex pharmaceutical mixtures by the Rietveld method, *Powder Diffraction*, 16, 20–24 (2001).
34. S. Rastogi, M. Zakrzewski and R. Suryanarayanan, Investigation of solid-state reactions using variable temperature X-ray powder diffractometry. I. Aspartame hemihydrate. *Pharm. Res.*, 18, 267–273 (2001).
35. A. Pyne and R. Suryanarayanan, Phase transitions of glycine in frozen aqueous solutions and during freeze-drying. *Pharm. Res.* 18, 1448–1454 (2001).
36. A.K. Dash, A. Khin-Khin and R. Suryanarayanan, X-ray powder diffractometric method for quantitation of crystalline drug in microparticulate systems. I: Microspheres. *J. Pharm. Sci.*, 91, 983–999 (2002).
37. R.K. Cavatur, N.M. Vemuri, A. Pyne, Z. Chrzan, D. Toledo-Velasquez and R. Suryanarayanan, Crystallization behavior of mannitol in frozen aqueous solutions. *Pharm. Res.*, 19, 894–900 (2002).
38. A. Pyne, R. Surana and R. Suryanarayanan, Crystallization of mannitol below T_g' during freeze-drying in binary and ternary aqueous systems. *Pharm. Res.*, 19, 901–908 (2002).
39. S. Rastogi, M. Zakrzewski and R. Suryanarayanan, Investigation of solid-state reactions using variable temperature X-ray powder diffractometry II. Aminophylline Monohydrate. *Pharm. Res.*, 19, 1265–1273 (2002).

40. A. Pyne and R. Suryanarayanan, The effect of additives on the crystallization of cefazolin sodium during freeze-drying. *Pharm. Res.*, 20, 283–291 (2003).
41. C. Telang, L. Yu and R. Suryanarayanan, Effective inhibition of mannitol crystallization in frozen solutions by sodium chloride. *Pharm. Res.*, 20, 660–667 (2003).
42. A. Pyne, K. Chatterjee and R. Suryanarayanan, Crystalline to amorphous transition of disodium hydrogen phosphate during primary drying. *Pharm. Res.*, 20, 802–803 (2003).
43. G.G.Z. Zhang, S.Y.L. Paspal, R. Suryanarayanan, D.J.W. Grant, Racemic species of sodium ibuprofen: Characterization and polymorphic relationships. *J. Pharm. Sci.*, 92, 1356–1366 (2003).
44. A. Pyne, K. Chatterjee and R. Suryanarayanan, Solute crystallization in mannitol-glycine systems – implications on protein stabilization in freeze-dried formulations. *J. Pharm. Sci.*, 92, 2272–2283 (2003).
45. C.E. Botez, P.W. Stephens, C. Nunes and R. Suryanarayanan, Crystal structure of δ -D-mannitol. *Powder Diffraction*, 18, 214218 (2003).
46. R. Surana, L. Randall, A. Pyne, N. M. Vemuri and R. Suryanarayanan, Determination of glass transition temperature and in situ study of the plasticizing effect of water by inverse gas chromatography. *Pharm. Res.*, 20, 1647–1654 (2003).
47. C. Telang, R. Suryanarayanan and L. Yu, Crystallization of D-mannitol in binary mixtures with NaCl: phase diagram and polymorphism. *Pharm. Res.*, 20, 1939–1945 (2003).
48. A. Pyne, R. Surana and R. Suryanarayanan, Enthalpic relaxation in frozen aqueous trehalose solutions. *Thermochimica Acta*, 405, 225–234 (2003).
49. R. Surana, A. Pyne and R. Suryanarayanan, Solid-vapor interactions: Influence of environmental conditions on the dehydration of carbamazepine dehydrate. *AAPS PharmSci Tech*, 4, Article 68, (2003).
50. S. Debnath and R. Suryanarayanan, Influence of processing-induced phase transformations on the dissolution of theophylline tablets. *AAPS PharmSci Tech*, 5, Article 8, (2004).
51. S. Debnath, P. Predecki and R. Suryanarayanan, Use of glancing angle X-ray powder diffractometry to depth-profile phase transformations during dissolution of indomethacin and theophylline tablets. *Pharm. Res.*, 21, 149–159 (2004).
52. C. Nunes, J. Han, D. Monkhouse and R. Suryanarayanan, Preformulation studies to meet the challenges in the manufacture of betaine solid dosage form. *J. Pharm. Sci.*, 93, 38–47 (2004).
53. R. Surana, A. Pyne and R. Suryanarayanan, Effect of aging on the physical properties of amorphous trehalose. *Pharm. Res.*, 21, 867–874 (2004).
54. J.D. Meyer, S.J. Bai, M. Rani, R. Suryanarayanan, R. Nayar, J.F. Carpenter, M.C. Manning, Infrared spectroscopic studies of protein formulations containing glycine. *J. Pharm. Sci.*, 93, 1359–1366 (2004).
55. R. Surana, A. Pyne, R. Suryanarayanan, Effect of preparation method on physical properties of amorphous trehalose. *Pharm. Res.*, 21, 1167–1172 (2004).
56. S.J. Bai, M. Rani, R. Suryanarayanan, J.F. Carpenter, R. Nayar, M.C. Manning, Quantification of glycine crystallinity by near-infrared INIR spectroscopy. *J. Pharm. Sci.*, 93, 2439–2447 (2004).
57. C. Nunes, R. Suryanarayanan, C.E. Botez, P.W. Stephens, Characterization and crystal structure of D-mannitol hemihydrate. *J. Pharm. Sci.*, 93, 2800–2809 (2004).
58. C. Telang and R. Suryanarayanan, Crystallization of cephalothin sodium during lyophilization from tert-butyl alcohol – water cosolvent system. *Pharm. Res.*, 22, 153–160 (2005).
59. K. Chatterjee, E.Y. Shalaev and R. Suryanarayanan, Raffinose crystallization during freeze-drying and its impact on recovery of protein activity. *Pharm. Res.*, 22, 303–309 (2005).
60. K. Chatterjee, E.Y. Shalaev, R. Suryanarayanan, Partially crystalline systems in lyophilization: I. Use of ternary state diagrams to determine extent of crystallization of bulking agent. *J. Pharm. Sci.*, 94, 798–808 (2005).
61. K. Chatterjee, E.Y. Shalaev and R. Suryanarayanan, Partially crystalline systems in lyophilization: II. Withstanding collapse at high primary drying temperatures and impact on protein activity recovery. *J. Pharm. Sci.*, 94, 809–820 (2005).
62. R. Surana, A. Pyne, M. Rani, R. Suryanarayanan, Measurement of enthalpic relaxation by differential scanning calorimetry – effect of experimental conditions. *Thermochimica Acta*, 433, 173–182 (2005).
63. C. Nunes, A. Mahendrasingam, R. Suryanarayanan, Quantification of crystallinity in substantially amorphous materials by synchrotron X-ray powder diffractometry. *Pharm. Res.*, 22, 1942–1953 (2005).
64. X. Liao, R. Krishnamurthy, R. Suryanarayanan, Influence of the active pharmaceutical ingredient concentration on the physical state of mannitol – implications in freeze-drying. *Pharm. Res.*, 22, 1978–1985 (2005).

65. R. Govindarajan, K. Chatterjee, L. Gatlin, R. Suryanarayanan, E.Y. Shalaev, Impact of freeze-drying on ionization of sulfonephthalein probe molecules in trehalose-citrate systems. *J. Pharm. Sci.*, 95, 1498–1510 (2006).
66. H. Yamada and R. Suryanarayanan, Calculation of the penetration depth of X-rays in intact pharmaceutical film-coated tablets by microdiffractometry. *Pharm. Res.*, 23, 2149–2157 (2006).
67. M. Rani, R. Govindarajan, R. Surana, R. Suryanarayanan, Structure in dehydrated trehalose dihydrate – evaluation of the concept of partial crystallinity. *Pharm. Res.*, 23, 2356–2367 (2006).
68. D.B. Varshney, S. Kumar, E.Y. Shalaev, S.W. Kang, L. Gatlin, R. Suryanarayanan, Solute crystallization in frozen systems – use of synchrotron radiation to improve sensitivity. *Pharm. Res.*, 23, 2368–2374 (2006).
69. C. Nunes, A. Mahendrasingam, R. Suryanarayanan, Investigation of the multi-step dehydration reaction of theophylline monohydrate using 2-dimensional powder X-ray diffractometry. *Pharm. Res.*, 23, 2393–2404 (2006).
70. R. Govindarajan, A.V. Zinchuk, B.C. Hancock, E.Y. Shalaev, R. Suryanarayanan, Ionization states in the microenvironment of solid dosage forms: Effect of formulation variables and processing. *Pharm. Res.*, 23, 2454–2468 (2006).
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BOOK CHAPTERS

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193. D.H. Barich, E.J. Munson, A.M. Kaushal, R. Suryanarayanan, Z. Zong, S. Desai, H-S. Huang, L.E. Kirsch, Characterization of gabapentin forms and stability using solid-state NMR spectroscopy, AAPS Annual Meeting, November 2009, Los Angeles, CA. AAPS Journal 11, S2.

194. S.P. Bhardwaj, B.L. Givot, R. Suryanarayanan, Effect of annealing on local mobility of trehalose, AAPS Annual Meeting, November 2009, Los Angeles, CA. AAPS Journal 11, S2.
195. B. Bhatnagar, S. Martin, D. Teagarden, E. Shalaev, R. Suryanarayanan, Investigation of phase transitions in aqueous t-butyl alcohol (TBA) solutions during freeze-thawing, AAPS Annual Meeting, November 2009, Los Angeles, CA. AAPS Journal 11, S2.
196. B. Bhatnagar, S. Martin, D. Teagarden, E. Shalaev, R. Suryanarayanan, Investigation of thermal behavior of frozen aqueous solutions of lactose and t-butyl alcohol (TBA) during freeze-thawing and freeze-drying, AAPS Annual Meeting, November 2009, Los Angeles, CA. AAPS Journal 11, S2.
197. B. Bhatnagar, S. Velaga, P. Chakravarty, R. Suryanarayanan, Impact of mannitol hemihydrate (MHH) dehydration on the physical stability of freeze-dried sucrose, AAPS Annual Meeting, November 2009, Los Angeles, CA. AAPS Journal 11, S2.
198. P. Chakravarty, R. Govindarajan, R. Suryanarayanan, Effect of in situ phase transformation on thiamine hydrochloride tablet properties, AAPS Annual Meeting, November 2009, Los Angeles, CA. AAPS Journal 11, S2.
199. A.M. Kaushal, Z. Zong, S.D. Desai, H-S. Huang, D.H. Barich, L.E. Kirsch, E.J. Munson, R. Suryanarayanan, Anhydrous and monohydrate gabapentin inter-conversion: Potential implications during solid dosage form manufacture, AAPS Annual Meeting, November 2009, Los Angeles, CA. AAPS Journal 11, S2.
200. A.M. Kaushal, V.R. Vangala, R. Suryanarayanan, Role of water in dehydration of dibasic calcium phosphate dihydrate, AAPS Annual Meeting, November 2009, Los Angeles, CA. AAPS Journal 11, S2.
201. P. Sundaramurthi, H. Yamada, R. Suryanarayanan. Evaluation of amorphous API content in the solid dispersions by differential scanning calorimetry, AAPS Annual Meeting, November 2009, Los Angeles, CA. AAPS Journal 11, S2.
202. P. Sundaramurthi, R. Suryanarayanan, Determination of the eutectic temperature of trehalose-water binary system by X-ray diffractometry (XRD), AAPS Annual Meeting, November 2009, Los Angeles, CA. AAPS Journal 11, S2.
203. P. Sundaramurthi, R. Suryanarayanan, Lyoprotectant crystallization in frozen solution and phase transformation during drying, AAPS Annual Meeting, November 2009, Los Angeles, CA. AAPS Journal 11, S2.
204. N.G. Tayade, A.M. Kaushal, R. Govindarajan, R. Suryanarayanan, In situ dehydration of dibasic calcium phosphate dihydrate in tablets: Effect on product properties, AAPS Annual Meeting, November 2009, Los Angeles, CA. AAPS Journal 11, S2.
205. Z. Zong, S.D. Desai, A.M. Kaushal, D.H. Barich, H-S. Huang, E.J. Munson, R. Suryanarayanan, L.E. Kirsch, The stabilizing effect of moisture on the solid-state degradation of gabapentin, AAPS Annual Meeting, November 2009, Los Angeles, CA. AAPS Journal 11, S2.
206. B. Bhatnagar, R. Affleck, J. Colandene, R. Suryanarayanan, Influence of formulation variables and processing conditions on mannitol hemihydrate formation during freeze-thawing and freeze-drying, AAPS National Biotech Conference, May 2010, San Francisco, CA. AAPS Journal 12, S1.
207. K.K. Arora, N.G. Tayade, R. Suryanarayanan, In situ cocrystallization in compressed tablets: Consequence of dehydration of dibasic calcium phosphate dihydrate, a commonly used excipient, AAPS Annual Meeting, November 2010, New Orleans, LA. AAPS Journal 12, S2.
208. S.P. Bhardwaj, B.L. Givot, R. Suryanarayanan, Global molecular mobility in amorphous trehalose and the effect of annealing, AAPS Annual Meeting, November 2010, New Orleans, LA. AAPS Journal 12, S2.
209. S.P. Bhardwaj, B.L. Givot, R. Suryanarayanan, Use of broadband dielectric spectroscopy to predict the water sorption potential of amorphous pharmaceuticals, AAPS Annual Meeting, November 2010, New Orleans, LA. AAPS Journal 12, S2.
210. B. Bhatnagar, S. Martin, T. Hodge, D. Teagarden, E. Shalaev, R. Suryanarayanan, Investigation of PEG crystallization during freeze-drying of a PEGylated protein – sucrose system: Implications on processing and stability, AAPS Annual Meeting, November 2010, New Orleans, LA. AAPS Journal 12, S2.
211. B. Bhatnagar, S. Martin, D. Teagarden, E. Shalaev, R. Suryanarayanan, Thermal and phase behavior of frozen aqueous sorbitol solutions, AAPS Annual Meeting, November 2010, New Orleans, LA. AAPS Journal 12, S2.
212. B. Bhatnagar, S. Martin, D. Teagarden, E. Shalaev, R. Suryanarayanan, Impact of annealing on the phase and sublimation behavior during freeze-thawing and freeze-drying of frozen aqueous solutions of lactose and t-butyl alcohol (TBA), AAPS Annual Meeting, November 2010, New Orleans, LA. AAPS Journal 12, S2.

213. M. Burcusa, T. Kamerzell, Y. Gokarn, R. Suryanarayanan, 'pH swing' in frozen phosphate buffer solutions, AAPS Annual Meeting, November 2010, New Orleans, LA. AAPS Journal 12, S2.
214. P. Chakravarty, R. Suryanarayanan, Characterization and structure analysis of thiamine hydrochloride methanol solvate, AAPS Annual Meeting, November 2010, New Orleans, LA. AAPS Journal 12, S2.
215. P. Chakravarty, R. Govindarajan, R. Suryanarayanan, Effect of in situ phase transformation on thiamine hydrochloride tablet properties and performance, AAPS Annual Meeting, November 2010, New Orleans, LA. AAPS Journal 12, S2.
216. A.M. Kaushal, E. Dempah, H-S.G. Huang, J. Qiu, E.J. Munson, L.E. Kirsch, R. Suryanarayanan, Phase transformations in gabapentin during wet granulation and drying, AAPS Annual Meeting, November 2010, New Orleans, LA. AAPS Journal 12, S2.
217. P. Sundaramurthi, R. Suryanarayanan, Succinate buffer crystallization in frozen and freeze-dried systems: effect of crystallizing and non-crystallizing cosolutes, AAPS Annual Meeting, November 2010, New Orleans, LA. AAPS Journal 12, S2.
218. P. Sundaramurthi, R. Suryanarayanan, Low-temperature behavior of carboxylic and amino acid buffers: relevance to freeze-drying, AAPS Annual Meeting, November 2010, New Orleans, LA. AAPS Journal 12, S2.
219. A. Alhalaweh, K.K. Arora, R. Suryanarayanan, S. Velaga, Retention of drug-coformer synthons in processed cocrystals, AAPS Annual Meeting, October 2011, Washington, D.C., AAPS Journal 13, S2.
220. S. Bhardwaj, R. Suryanarayanan, Two methods of thermal history removal in amorphous trehalose – effect on molecular mobility, AAPS Annual Meeting, October 2011, Washington, D.C., AAPS Journal 13, S2.
221. K. Arora, S. Bhardwaj, R. Suryanarayanan, A new polymorph of adefovir dipivoxil obtained by controlled dehydration of its dihydrate, AAPS Annual Meeting, October 2011, Washington, D.C., AAPS Journal 13, S2.
222. S. Bhardwaj, R. Suryanarayanan, Effect of water sorption on molecular mobility in amorphous trehalose, AAPS Annual Meeting, October 2011, Washington, D.C., AAPS Journal 13, S2.
223. S. Bhardwaj, R. Suryanarayanan, Effect of preparation method on molecular mobility in amorphous trehalose – implications on physical stability, AAPS Annual Meeting, October 2011, Washington, D.C., AAPS Journal 13, S2.
224. K. Arora, A. Alhalaweh, S. Velaga, R. Suryanarayanan, Crystallization behavior of melt-quenched indomethacin cocrystals, AAPS Annual Meeting, October 2011, Washington, D.C., AAPS Journal 13, S2.
225. M. Burcusa, I. Zarraga, Y. Gokarn, R. Suryanarayanan, Influence of mannitol on the crystallization of sodium phosphate-buffer components in frozen aqueous systems, AAPS Annual Meeting, October 2011, Washington, D.C., AAPS Journal 13, S2.
226. V. Ragoonanan, V. Sharma, T. Patapoff, R. Suryanarayanan, Crystallization of buffer components in frozen systems: Use of temperature cycling and low temperature pH measurements, AAPS Annual Meeting, October 2011, Washington, D.C., AAPS Journal 13, S2.
227. K. Arora, R. Suryanarayanan, Unintended water mediated cocrystal formulation in carbamazepine dehydrate tablets, AAPS Annual Meeting, October 2011, Washington, D.C., AAPS Journal 13, S2.
228. M. Burcusa, R. Suryanarayanan, Influence of xylitol in frozen, sodium-phosphate buffered solutions, AAPS Annual Meeting, October 2011, Washington, D.C., AAPS Journal 13, S2.
229. M. Mehta, S. Bhardwaj, R. Suryanarayanan, Controlling the physical form of Mannitol in Frozen Systems, AAPS Annual Meeting, October 2012, Chicago, IL.
230. K. Arora, S. Thakral, R. Suryanarayanan, Instability in theophylline hydrate tablets-Cocrystal formation due to release of lattice water, AAPS Annual Meeting, October 2012, Chicago, IL.
231. K. Kothari, R. Suryanarayanan, Investigating the role of polymer concentration on the physical stability of nifedipine-PVP solid dispersions, AAPS Annual Meeting, October 2012, Chicago, IL.
232. K. Kothari, R. Suryanarayanan, Investigating the role of polymer molecular weight on the physical stability of indomethacin-PVP solid dispersions, AAPS Annual Meeting, October 2012, Chicago, IL.
233. M. Burcusa, R. Suryanarayanan, Ability of xylitol to attenuate pH shifts in frozen sodium phosphate-buffer solutions, AAPS Annual Meeting, October 2012, Chicago, IL.
234. M. Burcusa, V. Ragoonanan, A. Aksan, R. Suryanarayanan, Use of spectroscopic techniques to characterize microheterogeneity in the freeze-concentrate of trehalose-sodium phosphate solutions, AAPS Annual Meeting, October 2012, Chicago, IL.
235. K. Arora, S. Bhardwaj, E. Kwong, SD. Clas, J. Ormes, J. Chang, P. Marsac, R. Suryanarayanan, Use of synchrotron radiation to detect first evidence of crystallization in amorphous itraconazole and its solid dispersions, AAPS Annual Meeting, October 2012, Chicago, IL.

236. K. Arora, S. Bhardwaj, E. Kwong, SD. Clas, J. Ormes, J. Chang, P. Marsac, R. Suryanarayanan, Solid dispersions of itraconazole- effect of polymer on physical stability and molecular mobility, AAPS Annual Meeting, October 2012, Chicago, IL.
237. K. Arora, S. Bhardwaj, E. Kwong, SD. Clas, J. Ormes, J. Chang, P. Marsac, R. Suryanarayanan, Correlation between molecular mobility and physical stability in amorphous itraconazole, AAPS Annual Meeting, October 2012, Chicago, IL.
238. S. Bhardwaj, R. Suryanarayanan, Molecular mobility as an effective predictor of the physical stability of amorphous state, AAPS Annual Meeting, October 2012, Chicago, IL.
239. V. Ragoonanan, R. Suryanarayanan, Use of ultrasonication as a selection tool for excipients used in frozen storage of pharmaceuticals, AAPS Annual Meeting, October 2012, Chicago, IL.
240. M. Mehta, R. Suryanarayanan, Controlling the Physical Form of Mannitol in Freeze-Dried Systems, AAPS Annual Meeting, November 2013, San Antonio, TX.
241. P. Mistry, S. Mohapatra, R. Suryanarayanan, Effect of Ionic Interactions on the Molecular Mobility and Physical Stability of Amorphous Solid Dispersions, AAPS Annual Meeting, November 2013, San Antonio, TX.
242. K. Kothari, V. Ragoonanan, R. Suryanarayanan, Effect of Sample Type on Dielectric Spectroscopy Measurements, AAPS Annual Meeting, November 2013, San Antonio, TX.
243. K. Kothari, V. Ragoonanan, R. Suryanarayanan, Influence of Moisture on the Molecular Mobility and Physical Stability of Amorphous Griseofulvin below the Glass Transition Temperature, AAPS Annual Meeting, November 2013, San Antonio, TX.
244. K. Kothari, V. Ragoonanan, R. Suryanarayanan, Molecular Mobility as an Effective Predictor of the Physical Stability of Amorphous Griseofulvin below the Glass Transition Temperature, AAPS Annual Meeting, November 2013, San Antonio, TX.
245. E. Munson, D. Arthur, N. Thakral, D. Gromek-Woods, R. Suryanarayanan, Comparison of Solid-State NMR, Laboratory XRPD, and Synchrotron XRPD as Quantitative Techniques for the Analysis of Polymorphs in Formulations, AAPS Annual Meeting, November 2013, San Antonio, TX.
246. K. Kothari, V. Ragoonanan, R. Suryanarayanan, Molecular Mobility and Hydrogen Bonding Interactions: Predictors of Drug Crystallization from Solid Dispersions, AAPS Annual Meeting, November 2013, San Antonio, TX.
247. N.K. Thakral, S. Mohapatra, G.A. Stephenson, R. Suryanarayanan, Effect of Compression on the Crystallization of Amorphous Indomethacin in Tablets, Denver X-Ray Conference (DXC), July 28 – Aug 1, 2014, Big Sky, MT.
248. N.K. Thakral, H. Yamada and R. Suryanarayanan, Profiling Spatial Distribution of Drug Crystallization in Tablets by 2D-XRD, Denver X-Ray Conference (DXC), July 28 – Aug 1, 2014, Big Sky, MT.
249. N.K. Thakral, S. Mohapatra, G. Stephenson, and R. Suryanarayanan, Compression Induced Crystallization of Amorphous Indomethacin in Tablets—Characterization of Spatial Heterogeneity by Two Dimensional X-ray Diffractometry, AAPS Annual Meeting, November 2014, San Diego, CA.
250. V. Ragoonanan, K. Kothari, and R. Suryanarayanan, Contribution of Hydrogen Bonding to Molecular Mobility in Amorphous Drugs, AAPS Annual Meeting, November 2014, San Diego, CA.
251. M. Mehta, J. Zhao, V. Ragoonanan, G. McKenna, and R. Suryanarayanan, Dielectric Spectroscopy: A Technique to Measure Structural Relaxation in Glassy Pharmaceuticals, AAPS Annual Meeting, November 2014, San Diego, CA.
252. M. Mehta and R. Suryanarayanan, Effect of Sorbed Water Content on the Molecular Mobility and Physical Stability of Amorphous Solid Dispersions, AAPS Annual Meeting, November 2014, San Diego, CA.
253. S. Thakral and R. Suryanarayanan, In Situ Salt Formation during Lyophilization—A Possible Strategy for Solubility Enhancement, AAPS Annual Meeting, November 2014, San Diego, CA.
254. M. Mehta, J. Zhao, V. Ragoonanan, G. McKenna, and R. Suryanarayanan, Influence of Polymer Properties on the Molecular Mobility in the Glassy State, AAPS Annual Meeting, November 2014, San Diego, CA.
255. D. Arthur, N.K. Thakral, C. Matos-Mejias, F. Osei-Yeboah, M. Nethercott, D. Gromek-Woods, E. Ghaly, G. Amidon, C.C. Sun, R. Suryanarayanan, and E. Munson, Monitoring Effects of Compaction Pressure and Storage Conditions on Polymorphic Changes of Chlorpropamide in Tablets, AAPS Annual Meeting, November 2014, San Diego, CA.
256. P. Mistry, S. Mohapatra, T. Gopinath, and R. Suryanarayanan, Role of the Strength of Drug-Polymer Interactions on the Molecular Mobility and Physical Stability of Amorphous Solid Dispersions, AAPS Annual Meeting, November 2014, San Diego, CA.

257. S. Thakral, R. Suryanarayanan, In situ salt formation during freeze-drying: a strategy to enhance indomethacin dissolution”, 2015 International Society for Lyophilization and Freeze Drying (ISFLD) Midwest Chapter Meeting, April 2015, Chicago, IL.
258. N. Thakral, G.A. Stephenson, R. Suryanarayanan, Polymorphic transformation of API during compression: contribution of hydrostatic pressure and shear stress. 2015 Gordon Research Conference, June 2015, Waterville Valley, NH.
259. S. Jena, R. Suryanarayanan, A. Aksan, Crystallization behavior in frozen mannitol-trehalose solutions, 2015 Protein Stability Conference, July 21 -23, 2015, Breckenridge, CO. The student received the Timasheff award (best poster).
260. M. Mehta, R. Suryanarayanan, Correlation between Molecular Mobility and Physical Stability in Glassy Pharmaceuticals, AAPS Annual Meeting, October 27, 2015, Orlando, FL.
261. M. Mehta, R. Suryanarayanan, Effect of Sorbed Water Content on the Molecular Mobility and Physical Stability of Felodipine – PVP Solid Dispersions, AAPS Annual Meeting, October 25, 2015, Orlando, FL.
262. E. Ghaly, M. Marrero, R. Suryanarayanan, Evaluation of Theophylline Tablet Formulations Prepared by Direct Compression Using Co-processed Excipient, AAPS Annual Meeting, October 25, 2015, Orlando, FL.
263. S. Koranne, R. Suryanarayanan, Salt Disproportionation in the Solid State – Characterization by Thermal, Spectroscopic and Diffractometric Techniques, AAPS Annual Meeting, October 25, 2015, Orlando, FL.
264. P. Mistry, S. Mohapatra, T. Gopinath, F. Vogt, A. Paradkar, R. Suryanarayanan, “Strength of Drug-Polymer Interactions: Implications on Molecular Mobility, Physical Stability and Dissolution Profiles of Amorphous Solid Dispersions, AAPS Annual Meeting, October 25, 2015, Orlando, FL.
265. M. Fung, R. Suryanarayanan, Effect of Plasticizer on the Physical Stability of Amorphous Solid Dispersions, AAPS Annual Meeting, October 25, 2015, Orlando, FL.
266. S. Kulkarni, J. Rinella Jr., R. Suryanarayanan, R. Bogner, Mannitol crystallization does not always reduce reconstitution time for high concentration lyophilized protein formulations, 2016 AAPS National Biotechnology Conference, May 16, 2016, Boston, MA.
267. S. Thakral, R. Suryanarayanan, Estimation of grain size by two-dimensional X-ray diffractometry: Applications to powders and after compression into tablets, PPXRD Symposium, June 6-9, 2016, Fort Myers, FL.
268. S. Koranne, R. Suryanarayanan, Characterization of spatial phase heterogeneity in tablets by X-ray diffractometry, David Grant Symposium, June 22, 2016, Minneapolis, MN.
269. K. Berzins, R. Suryanarayanan, Compression-induced stabilization of Sucrose-PVP solid dispersions, David Grant Symposium, June 22, 2016, Minneapolis, MN.
270. S. Thakral, N. Thakral, R. Suryanarayanan, Estimation of grain size by two-dimensional x-ray diffractometry, Application to powders and after compression into tablets, David Grant Symposium, June 22, 2016, Minneapolis, MN.
271. P. Mistry, R. Suryanarayanan, Molecular mobility as a polymer selection tool for amorphous solid dispersions, David Grant Symposium, June 22, 2016, Minneapolis, MN.
272. S. Mohapatra, P. Mistry, S. Samanta, R. Suryanarayanan, Effect of polymer molecular weight and concentration on crystallization behavior of indomethacin-PVP amorphous solid dispersions: Role of drug-polymer interaction and viscosity, 9th International Conference on Broadband Dielectric Spectroscopy and its Applications, September 11-16, 2016, Pisa, Italy.
273. P. Mistry, R. Suryanarayanan, Molecular mobility as a polymer selection tool for amorphous solid dispersions, AAPS 2016, November 14, 2016, Denver, CO.
274. S. Thakral, R. Suryanarayanan, Estimation of grain size by two-dimensional X-ray diffractometry: Applications to powders and after compression into tablets, AAPS 2016, November 15, 2016, Denver, CO.
275. M. Fung, K. Berzins, R. Suryanarayanan, The use of small molecule excipients for improving the physical stability and dissolution performance of ketoconazole spray-dried dispersions, AAPS 2016, November 16, 2016, Denver, CO.
276. S. Koranne, R. Suryanarayanan, Molecular mobility as a polymer selection tool for amorphous solid dispersions, AAPS 2016, November 16, 2016, Denver, CO.
277. S. Koranne, S. Thakral, R. Suryanarayanan, Effect of formulation and process parameters on the disproportionation of indomethacin sodium in lyophilized formulations, ISFLD Midwest Chapter Annual Meeting of the International Society of Lyophilization – Freeze Drying (ISLFD), April 13, 2017, Rosemont, IL.

278. S. Thakral, S. Koranne, R. Suryanarayanan, Spatial heterogeneity in mannitol phase composition in co-lyophilized binary systems, ISFLD Midwest Chapter Annual Meeting of the International Society of Lyophilization – Freeze Drying (ISLFD), April 13, 2017, Rosemont, IL.
279. S.S. Kulkarni, J.V. Rinella Jr., R. Suryanarayanan, R.H. Bogner, Why does crystallization of mannitol lower the reconstitution times of freeze-dried highly concentrated protein formulations?, Preclinical Form and Formulation Drug Discovery Gordon Research Seminar (GRS), June 2017. Stowe, VT.
280. S. Thakral, N.K. Thakral, R. Suryanarayanan, Estimation of grain size in pharmaceutical tablets by two-dimensional X-ray diffractometry, Aug 2, 2017, Denver X-ray Conference, Big Sky, MT.
281. S. Thakral (presenting author), S. Koranne, R. Suryanarayanan, Use of SXRD to study spatial heterogeneity in phase composition in co-lyophilized binary systems, Pharmaceutical Powder X-ray Diffraction Symposium (PPXRD-15), August 18-20, 2017, Hyderabad, India.
282. S.S. Kulkarni, R. Suryanarayanan, J.V. Rinella Jr., R.H. Bogner, Does crystalline mannitol always lower the reconstitution time of freeze-dried highly concentrated protein formulations?, International Society of Lyophilization-Freeze Drying (ISL-FD) Regional East Coast Chapter Meeting, September 2017, Cambridge, MA.
283. S.S. Kulkarni, R. Suryanarayanan, J.V. Rinella Jr., R.H. Bogner, Effect of processing conditions on reconstitution time of high concentration lyophilized protein formulations containing a crystallizable excipient (M5088), American Association of Pharmaceutical Scientists (AAPS) Annual Meeting, November 2017, San Diego, CA.
284. M. Fung, R. Suryanarayanan, The use of small molecule excipients for improving the physical stability and dissolution performance of amorphous solid dispersions (M6023), American Association of Pharmaceutical Scientists (AAPS) Annual Meeting, November 12-15, 2017, San Diego, CA.
285. M. Fung, M. DeVault, K. Berzins, K. Kuwata, R. Suryanarayanan, The use of a small molecule for physical stability prediction of amorphous solid dispersions (M4087), American Association of Pharmaceutical Scientists (AAPS) Annual Meeting, November 12-15, 2017, San Diego, CA.
286. S. Thakral, S. Koranne, R. Suryanarayanan, Spatial heterogeneity in mannitol phase composition in co-lyophilized binary systems (M8058), American Association of Pharmaceutical Scientists (AAPS) Annual Meeting, November 12-15, 2017, San Diego, CA.
287. K. Amponsah-Efah, P. Mistry, R. Eisenhart, R. Suryanarayanan, The influence of drug-polymer interactions on the dissolution performance of amorphous solid dispersions (T3002), American Association of Pharmaceutical Scientists (AAPS) Annual Meeting, November 12-15, 2017, San Diego, CA.
288. K. Amponsah-Efah, S. Samanta, N.K. Kumar, R. Suryanarayanan, Relaxation in glasses: Comparison of molecular mobility measurements by dielectric and calorimetric techniques (T3003), American Association of Pharmaceutical Scientists (AAPS) Annual Meeting, November 12-15, 2017, San Diego, CA (Received APQ Award).
289. A. Sahoo, N.K. Kumar, R. Suryanarayanan, Effect of polymer crosslinking on molecular mobility of ketoconazole amorphous solid dispersion (T3076), American Association of Pharmaceutical Scientists (AAPS) Annual Meeting, November 12-15, 2017, San Diego, CA.
290. S. Koranne, S. Thakral, R. Suryanarayanan, Effect of formulation and process parameters on the disproportionation of indomethacin sodium in lyophilized formulations (T4002), American Association of Pharmaceutical Scientists (AAPS) Annual Meeting, November 12-15, 2017, San Diego, CA.
291. N. Duggirala, R. Suryanarayanan, M. Sztucki, T. Narayanan, P. Mohanty, H. Tran, E. Shalaev, Impact of cooling conditions and an amorphous cosolute on crystallization of a surfactant during freeze-drying (T7052), American Association of Pharmaceutical Scientists (AAPS) Annual Meeting, November 12-15, 2017, San Diego, CA.
292. N. Duggirala, A. Vyas, J. Krzyzaniak, K. Arora, R. Suryanarayanan, Mechanistic insight into caffeine-oxalic cocrystal dissociation in formulations: Role of excipients (W4034), American Association of Pharmaceutical Scientists (AAPS) Annual Meeting, November 12-15, 2017, San Diego, CA.
293. S. Koranne, K. Arora, A. Sahoo, J. Krzyzaniak, S. Luthra, S. Shamblin, R. Suryanarayanan, Investigating the effect of formulation components and storage conditions on the solid-state stability of cocrystals (W4041), American Association of Pharmaceutical Scientists (AAPS) Annual Meeting, November 12-15, 2017, San Diego, CA.
294. S. Jena, J. Horn, W. Friess, R. Suryanarayanan, A. Aksan, Protein stability and excipient crystallization in freeze-dried mannitol-trehalose formulations (M5002), American Association of Pharmaceutical Scientists (AAPS) Annual Meeting, November 12-15, 2017, San Diego, CA (Received APQ Award).

295. J. Sonje, S. Thakral, R. Suryanarayanan, Influence of process variables on the physical state of mannitol in tert-butyl alcohol water systems, ISFLD Midwest Chapter Meeting, April 12, 2018, Chicago, IL.
296. N.K. Thakral, S. Thakral, R. Suryanarayanan, Compression Induced Phase Transformation: a formulator's perspective, SPS-XRPD 2018, presented in "From laboratory to synchrotron XRPD" section. May 6-8, 2018, Purdue University, W. Lafayette, IN.
297. S. Thakral, S. Koranne, R. Govindarajan, R. Suryanarayanan, Monitoring phase transformations in formulations, SPS-XRPD 2018, May 6-8, 2018, Purdue University, West Lafayette, IN.
298. S. Thakral, J. Sonje, R. Suryanarayanan, Anomalous behavior of mannitol hemi-hydrate: Implications on sucrose crystallization in colyophilized systems, ISL-FD Midwest Chapter Annual Meeting, April 11, 2019, Chicago, IL.
299. A. Thorat, R. Suryanarayanan, Characterization of phosphate buffered saline (PBS) in frozen state and after freeze-drying, ISL-FD Midwest Chapter Annual Meeting, April 11, 2019, Chicago, IL.
300. J. Sonje, S. Thakral, R. Suryanarayanan, Effect of process variables on physical state of mannitol in tert-butyl alcohol-water frozen systems, ISL-FD Midwest Chapter Annual Meeting, April 11, 2019, Chicago, IL.
301. A. Sahoo, R. Suryanarayanan, R. Siegel, Evaluation of critical polymer concentration (C^*) using drug as solvent and their effect on crystallization of drug, IPRIME Annual Meeting, Biomaterials and Pharmaceutical Materials (BPM) section, May 28-30, 2019, Minneapolis, MN.
302. N. Kaur, R. Suryanarayanan, The role of lattice disorder in water mediated dissociation of pharmaceutical cocrystal systems, IPRIME Annual Meeting, BPM section, May 28-30, 2019, Minneapolis, MN.
303. R. Tanaka, N.K. Duggirala, Y. Hattori, M. Otsuka, R. Suryanarayanan, Role and mechanism of soluble polymer for in-situ indomethacin-saccharin cocrystallization during high-shear wet granulation, IPRIME Annual Meeting, BPM section, May 28-30, 2019, Minneapolis, MN.
304. K. Amponsah-Efah, P. Mistry, R. Eisenhart, R. Suryanarayanan, The influence of drug-polymer interactions on the dissolution of amorphous solid dispersions, IPRIME Annual Meeting, BPM section, May 28-30, 2019, Minneapolis, MN.
305. "Processing-induced phase transformations", IPRIME Annual Meeting, May 28-30, 2019, University of Minnesota, Minneapolis, MN.
306. "Stabilization of Amorphous Drugs By Polymers: Effects of Polymer Molecular Weight and Drug/Polymer Interactions" (with A. Sahoo and R. Siegel [Presenter]), IPRIME Fall Meeting, August 6, 2020, University of Minnesota, Minneapolis, MN.
307. "Excipient Phase Transformations in Frozen and Freeze-dried Systems and Implications for Protein Stability" (with J. Sonje, S. Thakral, and B. Bhatnagar), IPRIME Fall Meeting, August 6, 2020, University of Minnesota, Minneapolis, MN.

INVITED LECTURES AT MEETINGS OF SCIENTIFIC ORGANIZATIONS

1. Short course entitled "Crystallization in the pharmaceutical sciences" as part of the Sixth Annual meeting of the American Association of Pharmaceutical Scientists (AAPS), Washington, DC. Delivered two lectures entitled "X-ray diffractometry of powder mixtures" and "Thermoanalytical techniques", November 17–21, 1991.
2. First International Conference on Pharmaceutical Sciences and Technology in conjunction with the Twenty Fourth Annual Meeting of the Fine Particle Society, Chicago, IL. Lecture entitled "Applications of quantitative powder X-ray diffractometry in pharmaceuticals", August 24–28, 1993.
3. 1995 Conference on Pharmaceutical Science and Technology in conjunction with the Twenty-sixth Annual Meeting of the Fine Particle Society, Chicago, IL. Lecture entitled "Qualitative and quantitative applications of powder X-ray diffractometry", August 22–25, 1995.
4. Chicagoland Discussion Group of the AAPS, Chicago, IL. Lecture entitled "Qualitative and quantitative applications of powder X-ray diffractometry", March 21, 1996.
5. Fifty-second Annual Calorimetry Conference, Pacific Grove, CA. Lecture entitled "Pressure differential scanning calorimetry. New applications in the study of hydrates", August 4, 1997.
6. Roundtable entitled "Will the Pharm.D. make the Pharmaceutics Ph.D. an endangered species?", as part of the Twelfth Annual meeting of the AAPS lecture entitled "Academic Perspective", Boston, MA, November 2–6, 1997.

7. First Annual AAPS-Northeast Regional Discussion Group Meeting, Hartford, CT. Symposium on “New advances in physical chemical measurements of conventional and biotechnology based pharmaceuticals”. Delivered a lecture entitled “Applications of powder X-ray diffractometry in preformulation and formulation”, April 27, 1998.
8. Conference on “Freeze-drying of pharmaceuticals and biologicals”, presented by the Center for Pharmaceutical Processing Research, Brownsville, VT. Delivered a lecture entitled “Low temperature X-ray diffraction studies of frozen systems”, September 23–26, 1998.
9. Thirty-fourth Annual Arden House Conference, “Instrumentation and process control for solid dose forms. Present and future”, sponsored by the AAPS Pharmaceutical Technology (PT) Section, Harriman, NY. Delivered a lecture on “Nature of the solid state”, and presented a case study entitled “Characterization of solid phase transformations in pharmaceutical processing”, January 17–22, 1999.
10. Forty-eighth Annual Denver X-ray Conference, sponsored by the International Centre for Diffraction Data, Steamboat Springs, CO. Delivered a lecture entitled “Examination of phase transformations during freeze-drying using low temperature X-ray powder diffraction”, August 2–6, 1999.
11. AACP Pharmaceutics Department Chairs’ Meeting held at the AAPS Fifteenth Annual Meeting, Indianapolis, IN. Delivered a lecture entitled “Physical characterization in pharmaceutical materials research”, 2000.
12. AAPS Sixteenth Annual Meeting, Denver, CO. Presented a lecture entitled “Use of powder X-ray diffractometry to monitor phase transitions during processing” at a symposium entitled “Emerging technologies: regulatory aspects and detecting solid-state changes during drug development”, October 23, 2002.
13. Forty-second Annual Conference on Pharmaceutical Analysis, “The role of pharmaceutical analysis in drug development: Right technique-right time”, sponsored by the Extension Services in Pharmacy, School of Pharmacy, University of Wisconsin-Madison. Presentation entitled “Use of X-ray powder diffractometry to monitor phase transitions during processing”, July 29– August 2, 2002.
14. “Use of X-ray powder diffractometry to monitor phase transitions during processing”, United States Pharmacopeia, Rockville, MD, September 16, 2002.
15. The British Pharmaceutical Conference and Exhibition, Science Symposium on “Material Science: polymorphism and hydration”, delivered a lecture entitled “Characterization and the stability assessment of pharmaceutical hydrates”, Manchester, UK, September 23–25, 2002 (lecture on September 24th).
16. “X-ray diffraction and structural analysis”, at the session entitled “Techniques in solid state characterization”, in the Sunrise Pharmacy School, 2002 AAPS Annual Meeting, Toronto, Ontario, Canada, November 12, 2002.
17. 2003 Denver X-ray Conference, sponsored by the International Centre for Diffraction Data, Denver, CO. Delivered a lecture entitled “Use of X-ray powder diffractometry to monitor phase transitions during processing”, August 4–8, 2003.
18. The 31st Annual Conference on Thermal Analysis and Applications sponsored by the North American Thermal Analysis Society (NATAS), Albuquerque, NM. Delivered the plenary lecture entitled “Applications of differential scanning calorimetry to pharmaceutical development”, and an invited lecture entitled “The use of DSC and XRD to characterize phase transitions during freeze-drying” September 22–24, 2003.
19. The Pharmaceutical Powder X-ray Diffraction Symposium (PPXRD 3) organized by the International Centre for Diffraction Data, Hilton Head Island, South Carolina. Delivered a lecture entitled “Use of X-ray powder diffractometry to monitor phase transitions during pharmaceutical processing”, February 23–25, 2004.
20. Workshop at the National Synchrotron Light Source (NSLS) meeting entitled “Pharmaceutical applications of synchrotron radiation”, Brookhaven National Laboratory, NY. Delivered a lecture entitled “Evaluation of the degree of crystallinity of pharmaceuticals”, May 17 2004.
21. Symposium at the annual meeting of the American Association of Colleges of Pharmacy entitled “The future of graduate education in pharmaceuticals and academia”, Salt Lake City, Utah. Delivered a lecture entitled “Discussion of a pharmaceuticals graduate program in a large research university – funding and graduate student recruitment issues”, July 10–14, 2004.
22. Conference on “Freeze-drying of pharmaceuticals and biologicals”, presented by the Center for Pharmaceutical Processing Research, Breckenridge, CO. Delivered a lecture entitled “Use of X-ray powder X-ray diffractometry and DSC to monitor excipient crystallization during freeze-drying”, July 29–31, 2004.

23. "Introduction to X-ray powder diffractometry", at the session entitled "X-ray Powder Diffractometry 101", in the Sunrise Session, 2004 AAPS Annual Meeting, Baltimore, Maryland, November 9, 2004.
24. AAPS 40th Annual Pharmaceutical Technologies Conference at Arden House, "Pharmaceutical Materials Science – From Drug Substance to Drug Product". Delivered two lectures on "Introduction to crystalline solids", and "Use of X-ray powder diffractometry and thermoanalytical techniques for phase identification and quantification", January 23–28, 2005.
25. AAPS, Pharmaceutics and Drug Delivery (PDD) Section Web Conference, "Challenges in Solid-State Characterization of Pharmaceuticals", April 29, 2005.
26. "Phase transitions during freeze-drying", at the plenary session entitled "Fundamentals of Biopreservation", at the 42nd Meeting of the Society for Cryobiology, Minneapolis, MN, July 24, 2005.
27. "Qualitative and quantitative applications of non-ambient X-ray diffractometry", at the session entitled "Non-ambient Powder Diffraction and Kinetic Studies", at the XX Congress of the International Union of Crystallography, Florence, Italy, August 23–31, 2005.
28. "Introduction to material science", at the short course entitled "Fundamentals of preformulation in pharmaceutical product development", two lectures at the 2005 Annual Meeting of the American Association of Pharmaceutical Scientists, Nashville, TN, November 5–6, 2005.
29. "Key messages from the Arden House Conference", at the Open Forum entitled "Regulatory and intellectual property issues related to pharmaceutical materials science and follow-up discussion to the AAPS pharmaceutical technologies conference at Arden House", 2005 AAPS Annual Meeting, Nashville, TN, November 6–10, 2005.
30. "Applications of X-ray diffraction analyses for the study of pharmaceuticals", at the short course entitled "Pharmaceuticals applications of XRD", two lectures at the 2005 AAPS Annual Meeting, Nashville, TN, November 5–6, 2005.
31. "Complementary techniques for the characterization of pharmaceutical systems", at the Pharmaceutical Powder X-ray Diffraction Symposium (PPXRD 5) organized by the International Centre for Diffraction Data, Somerset, NJ, February 14–16, 2006.
32. "Solid state chemical reactions of relevance in the stability of formulated drugs", at the roundtable entitled "Solid state chemical reactions of significance in the formulation and stability of solid dosage forms" at the 2006 AAPS Annual Meeting, San Antonio, TX, October 29 – November 2, 2006.
33. "Impact of Process Analytical Technology (PAT) on API preformulation studies", at the symposium entitled "Impact of PAT on API preformulation, formulation and process development" at the 2006 AAPS Annual Meeting Scientists, San Antonio, TX, October 29 – November 2, 2006.
34. "Applications in preformulation and formulation", at the short course entitled "Pharmaceuticals applications of XRD", at the 2006 AAPS Annual Meeting, San Antonio, TX, October 29 – November 2, 2006.
35. "Use of X-ray powder diffractometry in drug discovery, preformulation and drug product characterization" at the Pharmaceutical Powder X-ray Diffraction Symposium (PPXRD 6) organized by the International Centre for Diffraction Data, Barcelona, Spain, February 19–22, 2007.
36. "Pharmaceutical applications of synchrotron radiation" at the Pharmaceutical Powder X-ray Diffraction Symposium (PPXRD 6) organized by the International Centre for Diffraction Data, Barcelona, Spain, February 19–22, 2007.
37. "Use of DSC and XRD to characterize excipient phase transitions during freeze-drying" at the Innovations in Excipient Selection for Biopharmaceutical Formulation Development Symposium at the American Association of Pharmaceutical Scientists National Biotechnology Conference, San Diego, CA, June 23–27, 2007.
38. "Phase transitions during pharmaceutical processing – potential implications on product performance" at the GEA-NUS (Geotechnical and Environmental Associates – National University of Singapore) 10th Anniversary Commemorative Pharmaceutical Technology Conference, Singapore, December 17–19, 2007.
39. "Preformulation studies for tablet formulation development", part of the "Tablet Manufacturing Roundtable," at the 36th Controlled Release Society (CRS) Annual Meeting and Exposition, Copenhagen, Denmark, July 18–22, 2009.
40. "New Frontiers in XRD in Pharmaceutical R&D" at the Pharmaceutical Powder X-ray Diffraction Symposium (PPXRD 9) organized by the International Centre for Diffraction Data, Hilton Head, SC, February 22–25, 2010.

41. "Processing-induced phase transformations – Potential implications on product performance" at the 21st IUPAC International Conference on Chemical Thermodynamics ICCT 2010, Tsukuba, Japan, July 31–August 6, 2010.
42. "Monitoring phase transitions during freeze drying: Potential implications on product performance" at Freeze-Drying of Pharmaceuticals and Biologicals Symposium and Short Course, organized by University of Munich, University of Connecticut, and Dane O. Kildsig Center for Pharmaceutical Processing Research, Garmisch Partenkirchen, Germany, September 28–October 1, 2010.
43. Panel Discussion: "Current challenges and future applications of hot melt extrusion", Industrial Partnership for Research in Interfacial and Materials Engineering (IPrime) Workshop, January 2012.
44. Panel Discussion: "Optimizing the lyophilization process", 2nd Annual World Lyophilization Conference, Hanson Wade, London, UK, May 2012.
45. "Phase behavior of excipients in lyophilized formulations: Potential implications on product performance", Cambridge Healthtech Institute's 12th Annual Pep Talk, Palm Springs, CA, January 21-25, 2013.
46. "Frozen and freeze-dried systems – materials science issues", Chicagoland Pharmaceutical Discussion Group, March 31, 2013.
47. "Monitoring phase transitions in frozen systems and during freeze drying: Potential implications on product performance", International Society of Lyophilization – Freeze Drying, Inc. Midwest Chapter Annual Meeting, April 11, 2013.
48. "Crystallization of amorphous phases- Characterization by dielectric spectroscopy and x-ray diffractometry", Pharmaceutical Powder X-ray Diffraction Symposium (PPXRD-12), Beijing, China, May 23, 2013.
49. "Applications of XRD in preformulation and formulation studies", Pharmaceutical Powder X-ray Diffraction Symposium (PPXRD-12), Beijing, China, May 24, 2013.
50. "Materials science of pharmaceuticals: Drug-excipient interplay", 2013 AAPS Annual Meeting, David J. Grant Research Award Presentation, San Antonio, TX, November 12, 2013.
51. "Academic perspective on collaborations with industry (and FDA)", 2013 AAPS FDD Open Forum on "Strategic alliances with universities, spin-offs, start-ups and research institutions for co-creation of enabling technologies throughout the drug-development value chain", San Antonio, TX, November 14, 2013.
52. "Advanced X-ray diffractometric techniques to characterize multicomponent pharmaceutical systems", Cocrystals and Multicomponent Systems Session (II), AMPTEC 2014 Conference, Lille 1 University, Villeneuve d'Ascq, France, July 9-11, 2014.
53. "Applications of XRD in Preformulation and Formulation Studies", 2014 IUCr 23rd Congress and General Assembly, Montreal, Quebec, Canada, August 5-12, 2014.
54. "The Role of Annealing in Controlling the Physical Form During Freeze-Drying", at Freeze-Drying of Pharmaceuticals and Biologicals Short Course and Conference, organized by University of Munich, University of Connecticut, and Dane O. Kildsig Center for Pharmaceutical Processing Research, Garmisch-Partenkirchen, Germany, September 24, 2014.
55. "Evaluation of Polymorphic Changes during Tablet Manufacturing and Storage", Research Conference: Pharmaceutical Critical Path Manufacturing - 2015, April 30 - May 1, 2015, Rockville, MD (with Eric Munson).
56. "Advanced Characterization of Complex Dosage Forms to Demonstrate Product Equivalence", Generic Drug User Fee Amendments of 2012 Regulatory Science Initiatives: Request for User Input for FY 2015 Generic Drug Research Part 15 Public Hearing, U.S. Food and Drug Administration, Silver Spring, MD, June 5, 2015.
57. "Pharmaceuticals Materials Science: Unique Role of XRD in the Characterization and Quantification of Crystalline Phases", 2015 Annual Meeting of the American Crystallographic Association (ACA), Philadelphia, PA, July 26, 2015.
58. "Unique Role of XRD in the Characterization and Quantification of Crystalline Phases", the International Center for Diffraction Data (ICDD)'s Denver X-Ray Conference, Westminster, CO, August 6, 2015.
59. "Thermal Analysis to Design Freeze-dried Pharmaceuticals", 43rd Annual North American Thermal Analysis Society (NATAS) Conference, Montreal, Quebec, Canada, August 11, 2015.
60. "Molecular mobility in the amorphous state: implications of physical stability", at a roundtable session entitled, "What a guess! How to predict which polymer is the one for my amorphous solid dispersion" at the 2015 AAPS Annual Meeting and Exposition, Orlando, FL, October 27, 2015.

61. "Pharmaceutical materials science - role of excipients" at the Excipients Focus Group Town Hall Meeting, at the 2015 AAPS Annual Meeting and Exposition, October 27, 2015.
62. "Advanced Characterization of Drug Substances and Drug Products" (with Eric Munson, University of Kentucky) at the NIPTE/FDA Formulation Seminar, Silver Spring, MD, March 16, 2016
63. "Molecular Mobility in Pharmaceuticals and its Relevance to Predicting Stability of Solid Dispersions", AAPS Arden Conference, Baltimore, MD, April 18, 2016.
64. "Characterization of spatial phase heterogeneity in tablets by X-ray diffractometry" (with Sampada Koranne), Pharmaceutical Powder X-ray Diffraction Symposium (PPXRD), June 6-9, 2016, Fort Myers, FL.
65. "NIPTE's interest and efforts to support integrated scientific development of pharmaceutical products" at NIPTE Scientific Design of Pharmaceutical Products: 21st Century Methodologies, Technologies & Perspectives, FDA White Oaks Campus, Silver Spring, MD, October 4, 2016.
66. "Solubility enhancement through amorphization: Opportunities and challenges" at the American Chemical Society (ACS) Industry Symposium: Recent Advances in Drug Development, Hyderabad, India, November 11, 2016.
67. Member of the discussion panel, "Innovator versus Generic Drugs", ACS Industry Symposium: Recent Advances in Drug Development, Hyderabad, India, November 11, 2016.
68. "Diffraction methods for in-situ tablet characterization", AAPS 2016 Symposium Session: What's in that tablet? Advances in in-situ analytical characterization of dosage forms, Denver, CO, November 15, 2016.
69. "Role of physical form of the active pharmaceutical ingredient (API) and excipients", 68th Indian Pharmaceutical Congress (IPC), Visakhapatnam, India, December 17, 2016.
70. "Preparing for careers in industry and academia", 68th Indian Pharmaceutical Congress (IPC), Visakhapatnam, India, December 18, 2016.
71. "Predicting the physical stability of amorphous solid dispersions", 8th International Discussion Meeting on Relaxations in Complex Systems, Wisla, Poland, July 24, 2017.
72. "Phase transformations during freeze-drying: Potential implications on drug product performance", Second International Society of Lyophilization – Freeze-Drying, East Coast Chapter Meeting, held at Pfizer, Inc., Cambridge, MA, September 12, 2017.
73. "Quantitative applications of X-ray powder diffractometry" and "Non-ambient applications of X-ray diffractometry", Pharmaceutical Powder X-ray Diffraction Symposium (PPXRD-15), Hyderabad, India, August 18-20, 2017.
74. "Analytical techniques to ensure stable amorphous solid dispersions", Dialogue and Debate, in the topic "Metastable Formulations: Can Advances in Analytical Techniques Minimize the Risk?", American Association of Pharmaceutical Scientists (AAPS) Annual Meeting, November 12-15, 2017, San Diego, CA.
75. "Monitoring phase transitions in formulations", Spring Pharmaceutical Synchrotron X-Ray Powder Diffraction Workshop (SPS-XRPD), May 6-8, 2018, Purdue University, West Lafayette, IN.
76. "Role of the Physical Form of the Active Pharmaceutical Ingredient and Excipients", The 16th Pharmaceutical Powder X-ray Diffraction Symposium and the 2nd Spring Pharmaceutical Synchrotron X-ray Powder Diffraction Workshop, May 9-12, 2019, Paul Scherrer Institute, Switzerland.
77. "Dissolution enhancement by modulating the physical form of the API", Disso India 2019, organized by the Society for Pharmaceutical Dissolution Science, September 12-13, 2019, Chandigarh, India.
78. "The role of excipients in drug delivery", PHARMATECH 2020 – Exploring Myriads of Pharma in Pharmaceuticals and Pharmaceutical Technology, organized by the All India Council for Technical Education (AICTE) and the Indian Department of Science and Technology: the Gujarat Council on Science and Technology (DST-GUJCOST), October 28, 2020 (remote conference).
79. "Role of excipient and molecular mobility in stabilizing lyophilized protein", in the symposium session: Role of excipients in formulation drug product development at the AAPS Annual Meeting, Philadelphia, PA, Oct 17-20, 2021.
80. "Recent advances in the solid state drug product characterization", valedictory address at Pharma LabNext Conclave 2021, organized by Express Pharma, October 29, 2021 (remote conference).
81. "Role of excipients in frozen and freeze-dried protein formulations", in the Distinguished Scholars Session at the NIPTE Annual Research Conference – Accelerating the Drug Development Process, Tuesday, November 30, 2021.

82. "The role of excipients in efficient drug delivery", SNJB (Scientific and Novel Juvenilia Batten) Pharmacon 21 on Research, Innovations and Technologies: Challenges and Opportunities in Pharmaceutical Science (virtual conference), India, December 5, 2021.
83. "Excipient phase behavior in frozen and freeze-dried systems – Potential implications on drug stability", webinar organized by the AAPS NIPER Student Chapter – S.A.S. Nagar, presented virtually on August 18, 2022.
84. "Advanced Characterization of Solid-State Biological Products to Predict Stability", at the AAPS Annual Meeting, Boston, MA, October 17, 2022.
85. "Excipient phase behavior–Implications on protein stability", at the symposium session: Innovation Based on Non-Traditional Platforms at the AAPS National Biotechnology Conference, Philadelphia, PA, April 24, 2023.
86. "Phase transitions during freezing and freeze-drying ", at the conference session: The Physics of Freezing and Freeze-drying at the Freeze-drying of Pharmaceuticals and Biologicals Conference, Breckenridge, CO, August 2, 2023.
87. "Implications of excipient phase behavior on protein stability", Plenary Lecture at the International Society of Lyophilization – Freeze Drying, Inc. Midwest Chapter Annual Meeting, Northlake, IL, April 18, 2024.
88. "State of water in pharmaceuticals – implications on stability", at the 15h International Symposium on the Properties of Water, Purdue University, West Lafayette, IN, June 12, 2024.
89. "Implications of excipient phase behavior on protein stability", 2024 Colorado Protein Stability Conference, Breckenridge, CO, August 8, 2024.
90. "Time and temperature dependence of nucleation and crystallization in amorphous pharmaceuticals", 12th Conference on Broadband Dielectric Spectroscopy and its Applications, Lisbon, Portugal, September 2, 2024.

INVITED LECTURES AT UNIVERSITIES AND PHARMACEUTICAL COMPANIES

1. "Quantitative analysis of solid mixtures by powder X-ray diffractometry". Department of Pharmaceutical Technology, University of Bradford, Bradford, UK, December 17, 1989.
2. "Quantitative analysis of the active tablet ingredient by powder X-ray diffractometry". Fisons Pharmaceuticals, Leicestershire, UK, February 27, 1990.
3. "Quantitative analysis of solid mixtures by powder X-ray diffractometry". Fisons Pharmaceuticals, Leicestershire, UK, February 27, 1990.
4. "Quantitative analysis of the active tablet ingredient by powder X-ray diffractometry". Squibb and Sons Limited, Merseyside, UK, March 1, 1990.
5. "Quantitative analysis of the active tablet ingredient by powder X-ray diffractometry". Lilly Research Centre, Windlesham, UK, March 12, 1990.
6. "Solid state properties of the aminoglycoside antibiotic tobramycin". University of Bradford, Bradford, UK, March 14, 1990
7. "Quantitative analysis of polymorphic and pseudopolymorphic mixtures by powder X-ray diffractometry". Lilly Research Laboratories, Indianapolis, IN, April 23, 1990.
8. "Quantitative analysis of solid mixtures by powder X-ray diffractometry". 3M Pharmaceuticals, St. Paul, MN, July 25, 1990.
9. "Applications of X-ray diffractometry in pharmaceutical sciences". Technical Meetings of the International Centre for Diffraction Data, Concordville, PA, October 18, 1990.
10. "Applications of quantitative powder X-ray diffractometry in pharmaceuticals". 42nd Indian Pharmaceutical Congress, Manipal, India, December 30, 1990.
11. "Role of moisture on the effectiveness of carbamazepine tablets". College of Pharmacy, South Dakota State University, Brookings, SD, March 13, 1991.
12. "Applications of quantitative X-ray diffractometry in pharmaceuticals". College of Pharmacy, South Dakota State University, Brookings, South Dakota, March 13, 1991.
13. "Applications of quantitative X-ray diffractometry in pharmaceuticals". ICI Americas Inc., Wilmington, DE, September 11, 1991.
14. "Applications of quantitative X-ray diffractometry in pharmaceuticals". Merck Frosst Canada, Quebec, Canada, March 6, 1992.
15. "How storage condition can influence the effectiveness of pharmaceutical products: A case study with an antiepileptic drug". Bombay College of Pharmacy, Bombay, India, December 19, 1992.

16. "Applications of quantitative X-ray diffractometry in pharmaceuticals". SmithKline Beecham Pharmaceuticals, King of Prussia, PA, May 20, 1993.
17. "Solid state properties of drugs", Glycomed Inc., Alameda, CA, September 16, 1994.
18. "Qualitative and quantitative applications of powder X-ray diffractometry", Warner Lambert Company, Morris Plains, NJ, October 4, 1995.
19. "Qualitative and quantitative application of powder X-ray diffractometry", Rhone-Poulenc Rorer, Collegeville, PA, June 21, 1996.
20. "Pharmaceutical applications of X-ray diffractometry", Philips Analytical X-ray B.V., Almelo, The Netherlands, March 13, 1997.
21. "Characterization of frozen aqueous solutions by low temperature X-ray diffractometry", Lilly Research Laboratories, Indianapolis, IN, July 11, 1997.
22. "Characterization of frozen aqueous solutions by low temperature X-ray diffractometry", SmithKline Beecham Pharmaceuticals, King of Prussia, PA, August 12, 1997.
23. "Characterization of frozen aqueous solutions by low temperature X-ray diffractometry", Bristol-Myers Squibb Company, New Brunswick, NJ, August 13, 1997.
24. "Effect of solid-state of the active ingredient on the performance of pharmaceutical dosage forms", SPIC Limited, Maraimalai Nagar, India, December 10, 1997.
25. "Polymorphism in anhydrous theophylline – Implications on the dissolution rate of theophylline tablets", DuPont Merck Experimental Station, Wilmington, DE, January 26, 1998.
26. "Characterization of frozen aqueous solutions by low temperature X-ray diffractometry", Searle, Skokie, IL, March 6, 1998.
27. "Qualitative and quantitative applications of powder X-ray diffractometry", Rhone-Poulenc Rorer, Holmes Chapel, Cheshire, United Kingdom, July 9, 1998.
28. "Crystallinity evaluation by powder X-ray diffractometry", Pentech Pharmaceuticals, Wheeling, IL, October 22, 1998.
29. "Characterization of phase transitions during freeze-drying by in situ X-ray powder diffractometry", Glaxo Wellcome, Research Triangle Park, NC, November 2, 1998.
30. "Qualitative and quantitative applications of powder X-ray diffractometry", Glaxo Wellcome, Research Triangle Park, NC, November 2, 1998.
31. "Issues and challenges in quantitative powder X-ray diffractometry", Inhale Therapeutic Systems, San Carlos, CA, February 12, 1999.
32. "Characterization of phase transitions during freeze-drying by in situ X-ray powder diffractometry", Merck & Co., West Point, PA, March 12, 1999.
33. "Nature of the solid-state", Geneva Pharmaceuticals, Broomfield, CO, July 14, 1999.
34. "Introduction to X-ray powder diffractometry: Technique and utility", Bristol-Myers Squibb, Wallingford, CT, April 13, 2000.
35. "X-ray powder diffractometry: Advanced issues including quantitative analysis", Bristol-Myers Squibb, Wallingford, CT, April 13, 2000.
36. "Use of in situ X-ray powder diffractometry to characterize phase transitions during freeze-drying", Central Research, Groton, CT, April 14, 2000.
37. "Use of in situ X-ray powder diffractometry to characterize phase transitions during freeze-drying", Eli Lilly and Company, Indianapolis, IN, April 24, 2000.
38. "Use of in situ X-ray powder diffractometry to characterize phase transitions during freeze-drying", SSCI Inc., West Lafayette, IN, April 25, 2000.
39. "Some new approaches for the characterization of pharmaceutical solids", Glaxo Wellcome Research and Development, Research Triangle Park, NC, July 24, 2000.
40. "Characterization of solid phase transformations in pharmaceutical processing", Parke-Davis/Pfizer, Fresnes Cedex France, September 19, 2000.
41. "Study of pharmaceutical hydrates by pressure DSC, humidity controlled XRD", TGA and DSC. Schering Plough Research Institute, Kenilworth, NJ, January 15 2001.
42. "Amorphous pharmaceuticals – Preparation, characterization and stabilization", Purdue Pharma, Ardsley, NY, February 13, 2001.
43. "Applications of X-Ray powder diffractometry in preformulation and formulation", Boehringer Ingelheim Pharm., Inc., Ridgefield, CT, April 16, 2001.
44. "Characterization of phase transitions during freeze-drying by in situ X-ray diffractometry", Amgen Inc., Thousand Oaks, CA, April 17, 2001.

45. "Phase transitions during pharmaceutical processing – implications on product performance", Aventis Pharmaceuticals, Bridgewater, NJ, May 30, 2001.
46. "Issues and challenges in quantitative X-ray powder diffractometry", Aventis Pharmaceuticals, Bridgewater, NJ, May 30, 2001.
47. "Polymorphism in anhydrous theophylline – Implications on the dissolution rate of theophylline tablets", Lupin Limited, Pune, India, December 17, 2001.
48. "Polymorphism in anhydrous theophylline – Implications on the dissolution rate of theophylline tablets", Ranbaxy Research Laboratories, India, December 24, 2001.
49. "Phase transformations during pharmaceutical processing: implications on product performance". Eurand, Vandalia, Ohio, January 18, 2002.
50. "Use of DSC and XRD to characterize phase transitions during freeze-drying Human Genome Sciences Inc.", Rockville, MD, September 16, 2002.
51. "Importance of solid-state characterization in product development", 3M Pharmaceuticals, St. Paul, MN, August 18, 2003.
52. "Importance of solid-state characterization in product development", Fifth International SMS Users Group Meeting, Bethlehem, PA, October 12–14, 2003.
53. "Influence of preparation method on the properties of amorphous pharmaceuticals", Fifth International SMS Users Group Meeting, Bethlehem, PA, October 12–14, 2003.
54. "Phase transitions during pharmaceutical processing – potential implications on product performance". Merck Frosst Canada, Quebec, Canada, April 30, 2004.
55. "Review of the amorphous state and characterization". Nektar Therapeutics, San Carlos, CA, June 24, 2004.
56. "Phase transitions during pharmaceutical processing – potential implications on product performance". Forest Research Institute, Commack, NY, October 29, 2004.
57. "Qualitative and quantitative applications of powder X-ray diffractometry", Mitsubishi Pharma Corporation, Kashima, Japan, December 9, 2004.
58. "Quantitative applications of powder X-ray diffractometry", Boehringer Ingelheim Pharmaceuticals, Ridgefield, CT, September 19, 2005.
59. "Phase transitions during pharmaceutical processing – potential implications on product performance", Dr. Reddy's Laboratories Ltd., Hyderabad, India, November 24, 2005.
60. "Challenges when dealing with amorphous pharmaceuticals", Dr. Reddy's Laboratories Ltd., Hyderabad, India, November 25, 2005.
61. "Quantitative applications of powder X-ray diffractometry", Dr. Reddy's Laboratories Ltd., Qutubullapur, India, November 25, 2005.
62. "Effect of formulation variables and processing conditions on the physical state of mannitol", Human Genome Sciences, Rockville, MD, March 13, 2006.
63. "Physical form: Importance in solid formulations", Andrx Pharmaceuticals, Weston, FL, October 9, 2006.
64. "Physical form: Importance in solid formulations", North Dakota State University, Fargo, ND, October 16, 2006.
65. "Effect of preparation method and aging on the properties of amorphous trehalose", Merck & Co., West Point, PA, December 7, 2006.
66. "Use of powder X-ray diffractometry to (i) quantify crystallinity in substantially amorphous pharmaceuticals, and (ii) monitor phase transitions during freeze-drying", Merck & Co., West Point, PA, December 7, 2006.
67. "Effect of formulation variables and processing conditions on the physical state of mannitol", Pfizer, Chesterfield, MO, December 12, 2006.
68. "Effect of formulation variables and processing conditions on the physical state of mannitol", Cephalon, Inc., West Chester, PA, January 19, 2007.
69. "Use of XRD to optimize freeze-drying cycles", Panalytical, Almelo, The Netherlands, February 16, 2007.
70. "Use of X-ray powder diffractometry in drug discovery, preformulation and drug product characterization", Katholieke Universiteit Leuven, Leuven, Belgium, February 23, 2007.
71. "X-Ray powder diffractometry", Human Genome Sciences, Rockville, MD, April 10, 2007.
72. "Phase behavior of mannitol during lyophilization and subsequent storage", Human Genome Sciences, Rockville, MD, April 10, 2007.
73. "Physical form: Importance in solid formulations", Duquesne University, Pittsburg, PA, April 24, 2007.
74. "Physical form: Importance in solid formulations", Surmodics, Eden Prairie, MN, July 16, 2007.

75. "Quantitative applications of powder X-ray diffractometry", Ranbaxy Laboratories Ltd, Delhi, India, December 24, 2007.
76. "Quantitative applications of powder X-ray diffractometry", National Institute of Pharmaceutical Education & Research (NIPER), Chandigarh, India, December 27, 2007.
77. "Thermal characterization of amorphous pharmaceuticals" at the TA Instruments Users Meeting & Symposium, Scottsdale, AZ, May 4-7, 2008.
78. "Freeze-drying of pharmaceuticals - Use of synchrotron radiation", with Dr. Dushyant B. Varshney, Sanofi-Aventis, at Argonne Laboratory Users Week 2008, Argonne, IL, May 8, 2008.
79. "Phase transitions during pharmaceutical processing – Potential implications on product 'performance'", Bay Area Discussion Group, San Francisco, CA, May 29, 2008.
80. "Solid-state characterization and the drug development process", Smiths Detection Scientific, Saddle Brook, NJ, August 12, 2008.
81. "Physical form: Importance in solid formulations", Ecolab, Eagan, MN, October 28, 2008.
82. "Phase transitions during pharmaceutical processing – Potential implications on product performance", Lupin Limited (Research Park), Pune, India, February 12, 2009.
83. "Phase transitions during pharmaceutical processing – Potential implications on product performance", Janssen-Cilag, Johnson and Johnson, Mumbai, India, February 13, 2009.
84. "Effect of formulation variables and processing conditions on the physical state of excipients in lyophilized formulations" and "Quantitative applications of powder x-ray diffractometry", Bristol-Myers Squibb, Princeton, NJ, August 15-17, 2009
85. "Effect of formulation variables and processing conditions on the physical state of excipients in lyophilized formulations", Genentech, South San Francisco, CA, September 17, 2009.
86. Presented "Monitoring phase transitions during freeze-drying – Potential implications on product performance" and moderated roundtable discussion (with Dr. Sarma Duddu) at the Dr. David J.W. Grant Symposium: Solid State Pharmaceutics Present & Future, University of Minnesota, Minneapolis, MN, June 3-4, 2010.
87. "Processing induced phase transformations – Potential implications on product performance", Irma Lerma Rangel College of Pharmacy, Texas A & M, Kingsville, TX, August 27, 2010.
88. "Processing induced phase transformations – Potential implications on product performance", University of Kentucky, Lexington, KY, September 3, 2010.
89. "Processing induced API phase transformations", Merck Research Laboratories, Rahway, NJ, October 15, 2010.
90. "Processing induced phase transformations: Potential implications on product performance", University of Wisconsin, Madison, WI, October 20, 2010.
91. "Solid state form screening and selection methodologies and applications" and "Lyophilization: Excipient selection, potential form changes and impact on critical quality attributes", CACO Pharmaceutical & BioScience Society Bay Area Workshop: CMC Strategies for Robust Product Development & NDA Submissions, Foster City, CA, June 13, 2011.
92. "Strategies for controlling mannitol hemihydrate formation during freeze drying" and "Phase transitions during pharmaceutical processing – potential implications on performance", Amgen, Thousand Oaks, CA, August 30-August 31, 2011.
93. "Phase transitions during pharmaceutical processing - potential implications on product performance", Amneal Pharmaceuticals, Yaphank, NY, October 5, 2011.
94. "Monitoring phase transitions during freeze-drying - potential implications on product performance", GlaxoSmithKline, King of Prussia, PA, October 7, 2011.
95. "Monitoring phase transitions in frozen systems and during freeze-drying - potential implications on product performance", Baxter Healthcare Corporation, Roundlake, IL, September 14, 2012.
96. "Physical form of API and excipients – importance in oral and parenteral formulations", Mitsubishi Tanabe Pharma, Osaka, Japan, May 27, 2013.
97. "Excipients – Role in drug product performance", 45th Annual Pharmaceutics Graduate Student Research Meeting, Iowa City, Iowa, June 7, 2013.
98. Challenges with amorphous pharmaceuticals" at the seminar on "Green Processing Technologies for Poorly Soluble Drugs" organized by the UK-India Education and Research Initiative at the Institute of Chemical Technology (UKIERI), Mumbai, India, January 9, 2014.
99. Applications of XRD in preformulation and formulation studies" as part of the UK-India Education and Research Initiative, University of Hyderabad, Hyderabad, India, January 7, 2014.

100. "Predicting the Physical Stability of Amorphous Systems from Molecular Mobility", 2nd Dr. David J.W. Grant Symposium on Solid-State Pharmaceuticals, University of Minnesota, Minneapolis, Minnesota, May 21-22, 2014.
101. "Stabilization of amorphous phases", Webinar organized by the Center for Pharmaceutical Processing Research (CPPR), October 2, 2014.
102. "Excipients in freeze dried products", "Phase transitions in freeze drying", and "Product design by formulation & process changes", Freeze Drying Short Course, National University of Singapore, December 15-16, 2014.
103. "Transitions during pharmaceutical processing and product storage", Materials Science Approaches for Solving Drug Formulation Challenges, a One-Day Symposium-Discussion at the School of Chemistry, University of Hyderabad, India. Sponsored by UK-IN-US Collaboration Project Funded by UKIERI, December 19, 2014.
104. "Predicting the Physical Stability of Amorphous Systems from Molecular Mobility", Genentech, South San Francisco, CA, January 29, 2015.
105. "Transitions during pharmaceutical processing and product storage", Bay Area Discussion Group, Foster City, CA, January 29, 2015.
106. "Monitoring phase transitions during freeze-drying: potential implications on product performance", Bay Area Discussion Group, Foster City, CA, January 29, 2015.
107. "Predicting the Physical Stability of Amorphous Systems", AAPS Webinar organized by the AAPS Preformulation group, moderated by Joanna Bis, Ph.D., Catalent Pharma Solutions, March 19, 2015. "Processing induced phase transformations: Potential implications on product performance", Sun Pharma, Vadodara, India, June 17, 2015.
108. Presentations on behalf of the National Institute for Pharmaceutical Technology and Education (NIPTE) at Sun Pharma Tech Training Academy, Vadodara, India June 15, 2015
 - (i) Overview of QbD training program
 - (ii) QbD case study
109. "Effect of formulation variables and processing conditions on excipient phase behavior in lyophilized formulations", Sun Pharma, Vadodara, India, June 17, 2015.
110. "Processing induced phase transformations: Potential implications on product performance", Zydus Cadila, Ahmedabad, India, June 18, 2015.
111. "Predicting the Physical Stability of Amorphous Systems from Molecular Mobility", Dr. Reddy's Laboratories, Hyderabad, India, July 2, 2015.
112. "Applications of X-ray Powder Diffractometry (XRD) in Preformulation and Formulation Studies", Catalyst 2015, Dr. Reddy's Laboratories, Hyderabad, India, July 3, 2015.
113. "Crystallinity evaluation by powder X-ray diffractometry", Allergan, Irvine, CA, January 11, 2016
114. Delivered two lectures, "Monitoring phase transitions in frozen systems and during freeze-drying" and "Molecular mobility in pharmaceuticals and its relevance to predicting stability of solid dispersions", at Bristol-Myers Squibb, New Brunswick, NJ, April 20, 2016.
115. "Monitoring phase transitions in frozen system and during freeze-drying" at Bio-Techne, Minneapolis, MN, October 26, 2016.
116. "Profiling phase transformations in different regions of tablets by two dimensional X-ray diffractometry" at Biocon BMS, Bangalore, India, November 10, 2016.
117. "The influence of excipients, moisture and processing on pharmaceutical product properties relevant to physical stability", Pfizer, Sandwich, UK, December 1, 2016.
118. "Effective drug delivery – Importance of excipients and the physical form of the active pharmaceutical ingredient (API)", and "Sun-NIPTE Collaboration: The perspective of NIPTE scientists and academicians", delivered at Sun Pharma, Gurgaon, India, December 19, 2016.
119. "Interaction of water with amorphous pharmaceuticals", delivered at the Advances in Dynamic Vapor Sorption Methods & Surface Energy Characterization Workshop at the University of Minnesota, Minneapolis, MN, April 4, 2017.
120. "Processing induced phase transformations in small molecule and protein formulations: implications on drug product performance", delivered at Biogen, Cambridge, MA, June 15, 2017.
121. "Solubility enhancement through amorphization: Opportunities and challenges", Sun Pharma, Gurgaon, India, July 20, 2017.
122. "Phase Transformations During Freeze-Drying: Potential Implications on Drug Product Performance", presented as part of the LyoLearn Webinars series, SP Scientific, December 12, 2017.

123. "Characterization of frozen and freeze-dried systems by complementary analytical techniques" at Bio-Techne, Minneapolis, MN, February 28, 2018. The presentation was jointly given with Alpina Thorat, Ph.D.
124. "Role of the physical form of the active pharmaceutical ingredient (API) and excipients" at GlaxoSmithKline Singapore, Singapore, September 27, 2018.
125. "Monitoring Phase Transitions in Frozen Systems and During Freeze-Drying: Potential Implications on Product Performance", presented at Global Pharmaceutical Development Biologics, Sanofi, Framingham, MA, December 14, 2018.
126. "Effective drug delivery - role of the physical form of active pharmaceutical ingredients and excipients", presented at University of Kentucky, Lexington, KY, March 19, 2019.
127. "Phase behavior of API - role of excipients", presented at Merck, Rahway, NJ, May 23 2019.
128. "Physical stability of amorphous pharmaceuticals", presented at Applied Materials, Santa Clara, CA, August 23, 2019.
129. "Lattice disorder – implications in dosage form design" and "Phase transformations during freezing and freeze-drying - potential implications on product performance", presented at Genentech, South San Francisco, CA, August 21, 2019.
130. "Physical stability of amorphous pharmaceuticals", presented at Applied Materials, Santa Clara, CA, August 23, 2019.
131. "The role of excipients in drug delivery", presented at PHARMATECH 2020 - Exploring myriads of Pharma in Pharmaceuticals and Pharmaceutical Technology, sponsored by AICTE and GUJCOST-DST, October 28, 2020 (online).
132. "Role of excipients in efficient drug delivery", presented to the Integrated Product Development Organization, Dr. Reddy's Laboratories, Hyderabad, India, February 23, 2021 (online).
133. "Role of excipients in efficient drug delivery", presented to the Amgen Seminar Series in Chemical Engineering, sponsored by Amgen and the Department of Chemical Engineering at the University of Rhode Island, March 11, 2021 (online).
134. "Amorphous solid dispersions - design, characterization and stability prediction", presented at the Global Analytical Development Conference (GADC) across Sandoz Development Centres (SDC) on March 16, 2021 (online).
135. Participant in the Roundtable Discussion, "Polymorphs Throughout the Pharmaceutical Development Lifecycle" at Pharmanalytical Summit 2021: A Virtual Forum presented by Rigaku on March 26, 2021 (online).
136. "Excipient phase behavior in frozen and freeze-dried systems – potential implications on drug stability", presented at the 5th Annual David J.W. Grant Symposium in Minneapolis, MN, June 21-23, 2021.
137. "Inorganic atomic layer coating- a strategy to prevent moisture mediated phase transformation of pharmaceutically relevant compounds", presented at Applied Materials, Inc. in Santa Clara, CA, October 22, 2021.
138. "Challenges with amorphous pharmaceuticals", a keynote lecture delivered at the International Conference on Advances in the Dynamics and Thermodynamics of Glass Forming Systems, Department of Physics, University of Calicut, India, March 22, 2022.
139. "Excipient phase behavior in frozen and freeze-dried systems – Potential implications on drug stability", delivered as part of the University of Texas' Division of Molecular Pharmaceutics & Drug Delivery Seminar Series, on April 4, 2022.
140. "The role of excipients in efficient drug delivery", International Flavors & Fragrances Inc., Midland, Michigan, June 16, 2022.
141. "Importance of solid-state pharmaceutics in drug development", Creighton University, Omaha, NE, November 18, 2022,
142. "Time-Temperature Transformation for Amorphous Solid Dispersions", as part of the webinar series, The New Frontier of Amorphous Solid Dispersions", organized by BASF Pharma, May 11, 2023.
143. "Phase transitions during freezing and freeze-drying", webinar organized by ATS Life Sciences, August 30, 2023.
144. "Time-Temperature Transformation for Amorphous Solid Dispersions", as part of the webinar series, The New Frontier of Amorphous Solid Dispersions", organized by BASF Pharma, May 11, 2023.

145. "Platform for reliable characterization and evaluation of comparability of biosimilar drug products in lyophilized and liquid formulation," At the session entitled, "Biosimilars: What Pharmacy Professionals Need to Know", Howard University College of Pharmacy in collaboration with AMCP and FDA, Washington, April 5, 2023.
146. "Phase Transitions During Freezing and Freeze-drying," College of Pharmacy Dongguk University, South Korea, November 13, 2023.
147. "Implications of excipient phase behavior on protein stability", GlaxoSmithKline, Collegeville, PA, April 29, 2024.
148. "Implications of excipient phase behavior on protein stability", Advances in Drug Delivery Technologies for Bioavailability Enhancement, Ascendia Pharma, Princeton, NJ, September 17, 2024 GlaxoSmithKline, Collegeville, PA, April 29, 2024.

SYMPOSIUM AND SHORT COURSE PRESENTATIONS

1. Lecture on "Implantable devices and systems" at the Conference on Novel Drug Delivery Systems, College of Pharmacy, The University of Minnesota, September 20, 1988.
2. Taught in a short course organized by Technomic Publishing Company on "Controlled release using polymers: Characterization of solid drugs and excipients", Atlanta, GA, March 24–25, 1992.
3. Taught in a short course organized by Technomic Publishing Company on "Drug product R&D: Properties and characteristics of pharmaceutical materials", at Basel, Switzerland, October 11–12, 1993 and at St. Louis, MO, December 1–2, 1993.
4. Taught a short course (along with David Grant) at Abbott Laboratories, North Chicago, IL, on "Qualitative and quantitative characterization of crystalline solids", August 11, 1995.
5. Delivered three lectures entitled "Polymorphs – Properties and pharmaceutical implications", "X-ray powder diffraction and thermoanalytical techniques", and "Mixture analysis" at a workshop entitled "Crystallization and polymorphism issues in controlled release dosage forms", during the 25th International Symposium on Controlled Release of Bioactive Materials, Las Vegas, NV, June 25–26, 1998.
6. Crystal Form Summer Symposium organized by Central Research Division, Pfizer Limited, Sandwich, Kent, United Kingdom. Lecture entitled "Amorphous pharmaceuticals – Preparation, characterization and stabilization", July 7, 1998.
7. First International Workshop on Physical Characterization of Pharmaceutical Solids. Chaired a session entitled "Thermal analysis of drug substances and solid state characterization of formulation". Presented two keynote lectures: "Qualitative and quantitative applications of nonambient XRD", and "Thermoanalytical techniques for the characterization of drugs and dosage forms", Lancaster, PA, 2000.
8. Short course taught along with David Grant entitled "Crystallization and polymorphism" in Abbott Laboratories, North Chicago, IL, August 27 and 28, 2001.
9. Second International Workshop on Physical Characterization of Pharmaceutical Solids. Chaired two sessions entitled "A modern pharmaceutical solid state characterization laboratory" and "Polymorphs and solvates" and presented two keynote lectures: "Influence of pharmaceutical processing on phase changes", "Thermal analysis of amorphous pharmaceuticals", Lancaster, PA, September 23–28, 2001.
10. Presented a short course on "Solid state characterization of drugs, Curso Satellite del ICDD Workshop", Ciudad Universitaria – Cordoba, Argentina, delivered six 1-hour lectures, November 22–23, 2001.
11. ICDD – Workshop: Advanced methods in X-ray powder diffraction, Coordinated by ACC-Ceproc, Cordoba, Argentina, November 26–30, 2001. Presented a lecture entitled "Powder X-ray diffraction applications in pharmaceutical compounds" on November 27, 2001.
12. "Material science of drugs – Issues involved in drug candidate selection" at the 53rd Indian Pharmaceutical Congress, New Delhi, India. Presented a lecture entitled "Selection and characterization of the appropriate solid form of the drug candidate", December 21–23, 2001.
13. Third International Workshop on Physical Characterization of Pharmaceutical Solids, Thame, Oxfordshire, UK. Chaired a session entitled "Special XRD applications and structural properties", and presented a keynote lecture, "Phase transitions during pharmaceutical processing – Detection, quantification and implications on product performance" and two invited lectures, "Use of DSC and XRD to characterize phase transitions during freeze-drying", and "Influence of preparation method on the properties of amorphous pharmaceuticals", June 9–14, 2002.

14. Delivered a short course (equivalent to sixteen 45-minute lectures) on “Physical characterization of drugs”, at Paddock Laboratories, Minneapolis, MN, July 2002.
15. Salt Selection and Formulation/Preformulation Strategies, organized by Barnett International, Philadelphia, PA. Lecture entitled “Overcoming preformulation issues in salt selection” presented jointly with Rahul Surana March 1–2, 2004.
16. Conducted (along with Professor Ulrich Griesser, Institute of Pharmacy, University of Innsbruck, Austria) a short course on “Material Science issues in Pharmaceutics” as part of the Sandoz’ Global Development Meeting, Portoroz, Slovenia and delivered lectures entitled “Introduction to solid state”, “Characterization of pharmaceutical solids”, “Water-solid interactions”, and “Advanced applications of analytical techniques including phase quantification”, June 28 –30, 2004.
17. Sixth International Workshop on the Physical Characterization of Pharmaceutical Solids, Kazusa Academic Park, Chiba Japan. Chaired a session entitled “XRD applications and structural properties”, delivered a keynote lecture, “Characterization of amorphous systems”, and two invited lectures, “Preformulation studies to meet the challenges in the manufacture of betaine solid dosage form” and “Use of glancing angle X-ray powder diffractometry to depth-profile phase transformations during the dissolution of theophylline tablets”, December 5–8, 2004.
18. Chemical Development Symposium organized by Albany Molecular Research, Inc. Delivered a lecture entitled “Use of powder X-ray diffractometry to monitor phase transitions during pharmaceutical processing”, May 5–6 2005.
19. Technical Conclave, Analytical Chemistry, Dr. Reddy’s Laboratories Ltd., Hyderabad, India. Keynote lecture entitled “Physical form: Importance in solid formulations”, November 26, 2005.
20. First International Workshop on the Pharmaceutical Physical Characterization of the Amorphous State, Stamford, CT. Lecture entitled “Quantification of low levels of crystalline material in a substantially amorphous matrix”, May 8–9, 2006.
21. IBC’s 6th Annual Symposium on Formulation Strategies for Protein Therapeutics, San Francisco, CA. Keynote lecture, “Effect of formulation variables and processing conditions on the physical state of mannitol in lyophilized protein formulations”, November 6–8, 2006.
22. Three lectures entitled, “Amorphous pharmaceuticals”, “X-ray powder diffractometry and thermoanalytical techniques” and “Water-solid interactions and influence of processing”, at the 4th Annual Nassau Inn Meeting: Formulation and Process Development for Oral Dosage Forms, Princeton, NJ, April 22-27, 2007.
23. 59th Indian Pharmaceutical Congress short course, “Materials science: Fundamentals and implications in dosage form design”. Delivered lectures on “Fundamentals of material characterization” and “Materials Science: Regulatory Considerations” at Banaras Hindu University, Varanasi, India, December 22, 2007.
24. Conducted a 7-lecture short course entitled “Materials science of drugs” at Zydus Cadila, Ahmedabad, India, January 1–2, 2008.
25. Taught a short course (along with Sisir Bhattacharya) entitled, “Amorphous pharmaceuticals”, at Pfizer, St. Louis, MO, February 15, 2008.
26. Three lectures entitled “Amorphous pharmaceuticals”, “X-ray powder diffractometry and thermoanalytical techniques”, and “Water-solid interactions and influence of processing”, at the 5th Annual Nassau Inn Meeting: Formulation and Process Development for Oral Dosage Forms, Princeton, NJ, April 27-May 2, 2008.
27. “Solid state of pharmaceuticals: Properties and analysis”, at the I’ (IPrime) Industrial Partnership for Research in Interfacial and Materials Engineering 2008 Annual Meeting, Minneapolis, MN, May 28, 2008.
28. “Characterization of co-crystals, polymorphs and hydrates by XRD and DSC”, at the Indo-US Bilateral Workshop, sponsored by Indo-US Science and Technology Forum, Mysore, India, February 8-11, 2009.
29. Two lectures entitled “Introduction to pharmaceutical materials science” and “Phase transitions during pharmaceutical processing – Potential implications on product performance” as part of a “Pharmaceutical Materials Science– Special Topics” short course with Eric Munson and Naír Rodríguez-Hornedo at the National Institute of Pharmaceutical Education and Research (NIPER), Mohali, India, February 5-7, 2009.
30. Four lectures entitled “Introduction to pharmaceutical solids”, “Direct analysis of dosage forms”, “Quantitative analysis”, and “Non-ambient applications of XRD” at the Characterization of Pharmaceutical Solids workshop, PPXRD-8 Symposium, Glasgow, Scotland, May 4-7, 2009.

31. Three lectures entitled “Amorphous pharmaceuticals”, “X-ray powder diffractometry and thermoanalytical techniques”, and “Water-solid interactions and influence of processing” at the 6th Annual Nassau Inn Meeting: Formulation and Process Development for Oral Dosage Forms, Princeton, NJ, April 26-May 1, 2009.
32. “Processing induced phase transformations: How to guarantee product quality” at the Solvias Solid-State Conference, September 18, 2009.
33. “Processing induced phase transformations: Implications on product performance” at the Solvias Conference on Poorly Water Soluble Compounds 2010, Boston, MA, September 10, 2010.
34. Short course for Minnesota Job Skills Partnership grant: three case studies entitled “Phase transitions during pharmaceutical processing – Potential implications on product performance”, “Challenges when dealing with amorphous pharmaceuticals”, “Materials science: Regulatory considerations”, also four lectures: “Material science of drugs”, “Amorphous pharmaceuticals”, “Hydrates and solvates”, and “Characterization of frozen and freeze-dried systems - Potential implications on product performance” at Paddock Laboratories, Inc., New Hope, MN, July 2007 – October 27, 2010.
35. “Phase transition during freezing – implications”, in the session, “The Science of Freezing: Control, Excipients, Storage and Freeze-drying”, at the FIP Pharmaceutical Sciences World Congress 2010 in association with the AAPS Annual Meeting and Exposition, New Orleans, LA, November 18, 2010.
36. “Freeze-drying” lecture in “Preservation of Molecular Cellular and Tissue Biospecimens” short course at the Dane O. Kildsig Center for Pharmaceutical Processing Research conference, Minneapolis, MN, June 6, 2011.
37. “Protein stabilization” lecture in “Preservation of molecular, cellular and tissue biospecimens” BioCoR short course at the University of Minnesota, Minneapolis, MN, May 22, 2012.
38. “Phase behavior of excipients in lyophilized formulation- potential implications on product performance”, 2nd World Lyophilization Summit, Boston, MA, May 31, 2012.
39. “The Role of Annealing in Controlling the Physical Form During Freeze-Drying”, Freeze Drying of Pharmaceuticals & Biologicals Short Course and Conference, Garmisch-Partenkirchen, Germany, September 2014.
40. “Monitoring phase transitions during freeze-drying: potential implications on product performance”, TA Instruments 2012 Users Meeting and Symposium, Tucson, AZ, May 1, 2012.
41. “Phase transitions during pharmaceutical processing – Potential implications on product performance”, Vertex Pharmaceuticals, Boston, MA, June 2012.
42. Discussion Leader: Analytical tools to probe form and formulation, first Gordon Conference, “Preclinical Form and Formulation for Drug Discovery”, Waterville, Valley, NH, June 2-7, 2013.
43. “Understanding Material Properties to Design Robust Pharmaceutical Dosage Forms”, Agents of Change Research Symposium: The Global Impact of UBC Pharmaceutical Sciences Alumni, Vancouver, British Columbia, Canada, September 2014.
44. Research Conference: Pharmaceutical Critical Path Manufacturing ; moderated a panel session on "Quality Metrics" along with Ajaz Hussain, James Drennen, Lawrence Yu and Tara Goen Bizjak, Rockville, MD, April 30 - May 1, 2015.
45. Delivered a lecture, “Profiling Phase Transformations in Different Regions of Tablets by Two-Dimensional X-ray Diffractometry” and led a roundtable discussion at the David Grant Symposium, Minneapolis, MN, June 22, 2016.
46. “Amorphous Pharmaceuticals”, a short course presented at Aurobindo, Hyderabad, India, December 20, 2016.
47. “Powder XRD applications for pharmaceutical product development”, XRD Tools and Capabilities – Characterization of Pharmaceutical Formulations Short Course, held at the Pharmaceutical Powder X-ray Diffraction Symposium (PPXRD-15), Hyderabad, India, August 18-20, 2017.
48. As a part of the Globalization of Pharmaceutics Education Network (GPEN) held at Singapore, participated in a short course entitled, "Optimizing drug-like properties in discovery and development", and presented an invited lecture: "Processing-induced phase transformations"; September 29, 2018.
49. As a part of the Globalization of Pharmaceutics Education Network (GPEN) held at Minneapolis, participated in a short course entitled, "Drug Delivery Development Interface", and presented an invited lecture: "Role of excipients in efficient drug delivery"; October 19, 2022.
50. Delivered a lecture, “Assessing the crystallization propensity of amorphous solid dispersions using the time-temperature-transformation diagram” at the David Grant Symposium, Minneapolis, MN, June 14, 2023.

GRANTS

Current Projects:

Sponsor	Project Title	Total Amount	Project Dates	Role
Abbvie	Stabilization mechanisms in high protein load lyophiles	125,000	2023-2024	PI
NIPTE/FDA	Improving the efficiency of biosimilar products development	\$1,976,692	2022-2024	PI
Various	Various External Sales Projects	\$98,000	Ongoing	PI
CPPR/NSF (Genentech, Allergan, Amgen, BMS, Upsher-Smith, Janssen)	Phase Transformations During Pharmaceutical Processing. Current project: "Poloxamer 188 – a surfactant for frozen and freeze- dried protein formulations"	\$1,353,182	2000 – ongoing (membership model)	PI

Selected Past Projects

Sponsor	Project Title	Total Amount	Project Dates	Role
Incyte	Physical Characterization of Compounds	\$60,000	2004 – 2005	PI
Pfizer	Testing pH Relationships in Amorphous Solids	\$400,000	2001 – 2005	PI
Alkermes	Phase Transformations of Vivitrol and Risperdal Consta	\$52,000	2007 – 2008	PI
Upsher-Smith	Upsher-Smith Postdoctoral Fellowship	\$62,227	2008 – 2009	PI
Human Genome Sciences	Characterization of Lyophilized Formulations	\$102,500	2007 – 2009	PI
Mitsubishi	Stabilization of Amorphous Pharmaceuticals	\$87,540	2004 – 2010	PI
MN DEED (MN Job Skills Partnership)	Job Skills Training Program	\$385,739	2007 – 2010	PI
Forest Research Institute	X-ray Powder Diffractometry of Samples	\$50,000	2007 – 2010	PI
Pfizer	Lyophilization Cycle Development by Low Temperature X-Ray	\$662,656	2000 – 2010	PI
NIPTE	Development of Quality by Design (QbD) Guidance Elements on Design Space Specifications Across Scale with Stability Considerations	\$97,829	2008 – 2010	PI
Genentech	Buffer Salt Crystallization in Frozen Systems	\$95,000	2009 – 2011	PI
Genentech	Characterization of Formulation Component Phase Transitions During Freezing	\$95,000	2009 – 2011	PI
Teva	Characterization of Cyclophosphamide and Lyophilization of Cyclophosphamide Solutions	\$229,980	2010 – 2012	PI
Amgen	Quantification of Mannitol Hemihydrate in Lyophilized Formulations	\$55,300	2011 – 2012	PI
Lutonix	Characterization of Drug Coated Balloons	\$38,000	2011 – 2012	PI

Genentech	Excipient Phase Behavior in Frozen Solutions	\$50,000	2011 – 2012	PI
Merck	Effect of Preparation Method and Additives on Crystallization	\$66,000	2011 – 2013	PI
NIPTE	Evaluation of Polymorphic Changes in Tablet Manufacture	\$38,000	2013	PI
NIPTE	Propofol Inhalation Formulation	\$51,115	2013 – 2014	Co-I
British Council	UKIERI UK-US-India Trilateral Research in Partnership	\$25,050	2013 – 2015	PI
USP	Polymorph Characterization, Solubility Study, and BCS Determination of Praziquantel Drug Substance	\$47,953	2015 – 2015	PI
Allergan	Crystallinity of API and Excipients in Drug Delivery Systems	\$120,000	2015 – 2016	PI
Sun Pharma (NIPTE)	Development of NIPTE Industrial Training Program	\$69,156	10/01/2016 – 09/30/2017	Co-I
Sun Pharmaceuticals (was Ranbaxy)	Physical Characterization of Pharmaceuticals	\$3,600,000	2005 – 2017	PI
Lilly	Design Space of Manufacturing Processes	\$540,000	2013 – 2017	PI
Allergan	Characterization of Amorphous Solid Dispersions	\$70,000	2016 - 2017	PI
Celista	Preformulation and Formulation of Pharmaceutical Dosage	\$83,266	2015 – 2018	PI
Allergan	Crystallization of Excipients During Freeze-Drying of Placebo formulations	\$111,000	2016 – 2018	PI
Pfizer	Accelerating Solid Form and Drug Product Design of Solid Oral Dosage Forms	\$124,967	2016 – 2018	PI
IPrime	Upsher-Smith Industrial Fellow	\$10,000	2016 – 2018	PI
R&D Systems, Inc.	Characterization of Frozen and Freeze-Dried Systems	\$148,254	2017 – 2019	PI
AHC Faculty Research Development Grant	Optimal Intestinal Delivery of Therapeutic Microbiota Following Oral Administration	\$200,000	2017 – 2019	Co-I
UMN Grant-in-Aid	Freeze-dryer for Stabilization Studies of Pharmaceuticals, Proteins, Microbiome, Cell Therapies & Regenerative Medicine	\$50,000	2018 – 2019	Co-I
United States Pharmacopeial Convention	PQM Core NTD and Core TB promoting the Quality of Medicines Program (PQM)	\$45,900	2019	PI
National Science Foundation	Collaborative Research/GOALI: Processing and Stability of Amorphous Dispersions for Advanced Pharmaceutical Applications	\$199,715	2017 – 2021	PI
Applied Materials	Coating of Amorphous Particles – a Strategy to Prevent Crystallization	\$200,000	2018 – 2021	PI
Pfizer	Assessing physical stability of API in the manufactured drug product using PCMM technology: Hydrates for dehydration risk and impact of extent of lubrication	\$115,000	2019-2021	PI

Boehringer-Ingelheim	Performance of amorphous solid dispersions: Role of residual drug crystallinity	\$65,088	2021-2022	PI
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GRADUATE STUDENTS SUPERVISED

Graduate Students Supervised - Graduated				
Name	Degree Awarded	Year	Thesis Title	First (or Current) Position
Alekha K. Dash	Ph.D.	1990	Development of Implantable Polymeric Drug Delivery Systems to Treat Bone Infections	Professor & Gilbert F. Taffe Jr. Endowed Chair, Creighton University
Srinivasan Venkatesh	Ph.D.	1993	Characterization of Polymer-Mucin Bioadhesive Systems	Chief Executive Officer, TearClear
Nithya K. (Iyer) Singh	M.S.	1994	Effect of Storage Under High Relative Humidity on the Properties of Carbamazepine Tablets	Oncology Global Clinical Development Manager, Tesaro/GSK
Neelima V. Phadnis	Ph.D.	1997	Novel Applications of X-ray Powder Diffractometry in the Study of Pharmaceutical Solids	Consultant/Contractor, Pharmaceuticals & R&D, Phadnis Consultancy Services
Jitesh Tank	M.S.	1997	Changes in the Solid-State of Theophylline Upon Aqueous Wet Granulation	Sr. Director, Strategy and Business Development, CDRM, Medtronic
Jun Han	Ph.D.	1998	Influence of Environmental Conditions on the Dehydration of Pharmaceutical Hydrates	Global R&D Product Manager, Barr Pharmaceuticals
Raghu K. Cavatur	Ph.D.	1999	Characterization of Phase Transitions During Pharmaceutical Processing	Director, RAPT Therapeutics
Yinghua (Li) Paspal	Ph.D.	2000	Preparation and Characterization of Amorphous Pharmaceuticals	Chief Development Officer and Executive VP Quality, Xynomic Pharma
Suneel Rastogi	Ph.D.	2000	Phase Transitions and Decomposition Rates in Pharmaceutical Solids	Independent Consultant
Abira (Pyne) Ramakrishnan	Ph.D.	2001	Phase Transitions During Freeze-Drying: Influence of Processing Conditions and Formulation Variables	Senior Director, Foghorn Therapeutics
Rahul Surana	Ph.D.	2002	Influence of Thermal History and Interaction with Plasticizers on the Properties of Amorphous Pharmaceuticals	Executive VP and Chief Operating Officer, Scienture
Smita R. Debnath	Ph.D.	2003	Effect of Processing Induced Transitions on the Dissolution Rate of Drugs with Low Aqueous Solubility	Scientific Leader, Pharmascience

Graduate Students Supervised - Graduated				
Name	Degree Awarded	Year	Thesis Title	First (or Current) Position
Koustuv Chatterjee	Ph.D.	2004	Chemical Reactivity and Physical Stability of Lyophilized Solids	Senior Vice President, Sanofi
Chitralkha D. Telang	Ph.D.	2004	Pharmaceutical Lyophilization: Physical Stability Issues and Application of Ternary State Diagram	Director, Immunovant
Cletus J. Nunes	Ph.D.	2005	Use of High-Intensity X-Radiation in Solid-State Characterization of Pharmaceuticals	Executive Director, Bristol Myers Squibb
Sachin Lohani	Ph.D.	2006	Understanding Nucleation Processes in the Crystallization of Polymorphs	Executive Director, Eli Lilly
Enxian Lu	Ph.D.	2008	Stabilization of Amorphous Pharmaceuticals by Excipients	CEO, Auson Pharmaceuticals
Sisir Bhattacharya	Ph.D.	2008	Molecular Mobility in Amorphous Pharmaceuticals - Implications of Heterogeneity	Senior Director, Global Director of Manufacturing Science and Analytical Technology, Servier
Dabing Chen	Ph.D.	2009	Hygroscopicity of Pharmaceutical Crystals	Senior Principal Scientist, Boehringer-Ingelheim
Paroma Chakravarty	Ph.D.	2010	Phase Behavior of Thiamine Hydrochloride Physical Forms	Senior Principal Scientist, Genentech
Prakash Sundaramurthi	Ph.D.	2010	Solute Crystallization in the Frozen and Freeze-Dried Systems: Inhibition of Crystallization to Enhance Pharmaceutical Stability	Executive Director, Marinus Pharma
Sunny P. Bhardwaj	Ph.D.	2012	Molecular Mobility in Amorphous State: Implications on Physical Stability	Associate Director, Bausch Health Companies
Michael R. Burcusa	M.S.	2013	Excipient Phase Behavior in the Freeze-Concentrate	Chemistry Teacher, Shakopee High School
Khushboo Kothari	Ph.D.	2014	The Role of Molecular Mobility and Hydrogen Bonding Interactions on the Physical Stability of Amorphous Pharmaceuticals	Associate Director, Takeda
Mehak Mehta	Ph.D.	2016	Molecular Mobility in Pharmaceutical Glasses: Implications on Physical Stability	Senior Scientist, Moderna
Pinal Mistry	Ph.D.	2016	Strength of Drug-Polymer Interactions: Implications on Molecular Mobility and Crystallization in Amorphous Dispersions	Associate Director, Osanni Bio
Michelle Fung	Ph.D.	2017	Effects of Additives on Molecular Mobility, Physical Stability, and Dissolution of Amorphous Solid Dispersions	Associate Principal Scientist, Merck

Graduate Students Supervised - Graduated				
Name	Degree Awarded	Year	Thesis Title	First (or Current) Position
Sampada Koranne	Ph.D.	2018	Physical Stability of Pharmaceutical Salts and Co-crystals in Drug Product Development	Associate Principal Scientist, Merck
Jayesh Sonje	M.S.	2019	Mannitol - a Potential Cryoprotectant in Frozen and Freeze-dried Formulations	Senior Scientist, Pfizer
Kweku Konadu Amponsah-Efah	Ph.D.	2020	Effects of Additives on the Molecular-level Behavior of Disordered Pharmaceuticals	Merck
Jinghan Li	M.S.	2021	Design of Amorphous Solid Dispersions for the Synchronized Release of Two Drugs	Applications Scientist, Croda
Navpreet Kaur	Ph.D.	2021	Understanding the Stability of Salts and Cocrystals in a Drug Product Environment	Scientist, Sanofi
Jayesh Sonje	Ph.D.	2022	Excipient Phase Transformations in Frozen and Freeze-Dried Formulations and their Impact on Protein Stability	Senior Scientist, Pfizer
Rahul Lalge	Ph.D.	2023	Understanding the Role of Excipients on the Physical Stability of Amorphous Pharmaceuticals through Time–Temperature–Transformation	Investigator, GlaxoSmithKline
Wenqi “Kiki” Gai	M.S.	2023	pH Shifts in tris Buffer during Freeze Thawing	Scientist I, Frontage Laboratories
Jinghan “Tony” Li	Ph.D.	2024	Role of surfactants in the stabilization of protein formulations	Applications Scientist, Croda
Chaowang Zeng	M.S.	2024	Effect of processing and cosolutes on mannitol phase behavior in frozen solutions	PhD student; University of Maryland

Postdoctoral Associates, Visiting Scholars & Research Associates (since 2007)			
Dates	Name	Role with Sury Lab	Current Position
2023 – current	Aziz Ahmad, Ph.D.	Postdoc	
2019 – Current	Bhushan Munjal, Ph.D.	Postdoc	-
2017 – Current	Krishna Kumar, Ph.D.	Postdoc	-
2015 – 2021	Seema Thakral, Ph.D.	Research Scientist	Researcher, Characterization Facility, University of Minnesota (concurrent)
2013 – 2015		Postdoc	
2011 – 2013		Visiting Scholar	
2017 – 2019	Anasuya Sahoo, Ph.D.	Postdoc	Postdoc, University of Minnesota (Siegel Lab)

2017 – 2019	Alpana Thorat, Ph.D.	Postdoc	Scientist, Pfizer
2016 – 2018	Naga Duggirala, Ph.D.	Postdoc	Scientist, Pfizer
2016 – 2017	Amber Vyas, Ph.D.	Visiting Scientist	Assistant Professor, Pt. Ravishankar Shukla University
2016 – 2017	Subarna Samanta, Ph.D.	Postdoc	Postdoc, University of Pennsylvania
2015 – 2016	Kārlis Bērziņš, Ph.D.	Visiting Scientist	Researcher, Latvian Institute of Organic Synthesis
2012 - 2016	Naveen Thakral, Ph.D.	Postdoc	Associate Director, Boeringer Ingelheim
2010 - 2014	Vishard Ragoonanan, Ph.D.	Postdoc	Scientist, Allergan
2013	Jianjun “Andrew” Zhang	Visiting Professor	Professor, China Pharmaceutical University
2012 - 2014	Sarat Mohapatra, Ph.D.	Research Associate	Retired
2009 – 2012	Kapildev Arora, Ph.D.	Postdoc	Principal Scientist, Pfizer
2008 – 2011	Nitin Tayade, Ph.D.	Postdoc	Formulation Technologies Manager, Colorcon Asia
2008 - 2011	Bakul Bhatnagar, Ph.D.	Research Associate	Principal Scientist, Pfizer
2006 - 2008		Postdoc	
2007 – 2010	Aditya Kaushal, Ph.D.	Postdoc	Formulation Scientist, Bend Research
2008 – 2010	Ajay Saxena, Ph.D.	Postdoc	Sr. Principal Investigator, BMS
2007 – 2009	Venugopal Vengala, Ph.D.	Postdoc	Lecturer, University of Bradford

Membership on Ph.D./M.S. Committees (Ph.D. in Pharmaceuticals unless otherwise noted)

Member of the Final Ph.D./M.S. Committee for:							
Name	Grad Year	Degree Awarded	Role/ Subject	Name	Grad Year	Degree Awarded	Role/ Subject
Y. Guo	2021	Ph.D.	Chair	S. Debnath	2001	Ph.D.	Chair; Chem.
I. Duggal	2021	M.S.		Y. Gu	2001	Ph.D.	
K. Jain	2021	Ph.D.		P. A. Kothare	2001	Ph.D.	
N. Kaur	2021	Ph.D.		A. Lakkaraju	2001	Ph.D.	
H. Chen	2020	Ph.D.	Chair	H. Song	2001	Ph.D.	Chair
K. Amponsah-Efah	2020	Ph.D.		R. Surana	2001	Ph.D.	
S. Hanson	2020	Ph.D.		L. Carlson	2001	Ph.D.	
K. Wang	2020	Ph.D.		R. Bhatia	2000	M.S.	
J. Sonje	2019	M.S.	Chemistry	Z. Lu	2000	M.S.	Chair
J. Dun	2019	Ph.D.		P. Vanchy	2000	M.S.	
D. Rautiola	2019	Ph.D.		Z. Wu	2000	Ph.D.	
S. Y. Chang	2019	Ph.D.		A. Lakkaraju	2000	Ph.D.	
S. Koranne	2018	Ph.D.	Chair	P. Kothare	2000	Ph.D.	Chair
M. Fung	2017	Ph.D.		C. Sun	2000	Ph.D.	
S. Jena	2017	Ph.D.		R. Bhatia	2000	M.S.	
W.J. Sun	2017	Ph.D.		J. Brandt	1999	M.S.	
S. Vang	2017	M.S.	Chemistry	H. Song	1999	Ph.D.	Chair
R.G. Ricarte	2016	Ph.D.		S. Rastogi	1999	Ph.D.	
P. Mistry	2016	Ph.D.		S. Pham	1999	Ph.D.	
A. Wolf	2015	Ph.D.		A. Pyne	1999	Ph.D.	
L. Niu	2015	Ph.D.	Chair	F. Panda	1999	M.S.	Chair
F. Osei-Yeboah	2015	Ph.D.		B. W. Cheung	1998	Ph.D.	
M. Mehta	2015	Ph.D.		M. A. Tutuncu	1998	Ph.D.	
L. M. Johnson	2014	M.S.		S. M. Wick	1998	Ph.D.	
I. Koonar	2014	Ph.D.	Chair	Y. Li	1998	Ph.D.	Chair
K. Kothari	2014	Ph.D.	Chair	L. Musib	1998	Ph.D.	
A. M. Twomey	2013	M.S.	Mech. Eng.	S. Pham	1998	Ph.D.	
M. Burcusa	2013	M.S.	Chair	R. Cavatur	1998	Ph.D.	
S. Chatteraj	2012	Ph.D.		S. M. Wick	1998	Ph.D.	

Member of the Final Ph.D./M.S. Committee for:							
S. Bhardwaj	2011	Ph.D.		R.	1998	Ph.D.	
P. Sundaramurthi	2008	Ph.D.		Bandyopadhyay			
P. Chakravarty	2007	Ph.D.		J. Sheng	1998	M.S.	
D. Chen	2007	Ph.D.		G. Zhang	1997	Ph.D.	
S. Bhattacharya	2007	Ph.D.		X. He	1997	M.S.	
E. Lu	2007	Ph.D.		Z. Yang	1997	Ph.D.	
Y. Feng	2006	Ph.D.	Chair	H. J. Zhu	1997	Ph.D.	
N. Rai	2006	Ph.D.		J. Han	1997	Ph.D.	
S. Lohani	2006	Ph.D.		J. Tank	1997	M.S.	
X. Zhao	2006	Ph.D.		R. C. Brundage	1996	Ph.D.	
A.S.B. Bhalla	2005	Ph.D.		N. Phadnis	1996	Ph.D.	
L. A. Belcourt	2005	M.S.		Z. Li.	1996	Ph.D.	
S. Datta	2004	Ph.D.		Y. Lo	1995	Ph.D.	Chair
Y. Gu	2003	Ph.D.		S. Leung	1995	Ph.D.	
T. J. Puhek	2003	M.S.	Food Science	B.W. Cheung	1995	Ph.D.	
				D. Law	1994	Ph.D.	
P. L. Minerich	2002	Ph.D.	Food Science	D. V. Moe	1994	Ph.D.	
F. A. Panda	2002	M.S.	Food Science	N. Iyer	1994	M.S.	
Z. J. Peng	2002	Ph.D.		S. Ghosh	1993	Ph.D.	Chair
C. P. Sherwin	2002	Ph.D.		J.C Hedenstrom	1993	Ph.D.	
D. Sharmistha	2004	Ph.D.		R. K. Schultz	1993	Ph.D.	Chair
D. Dronen	2004	Ph.D.		R.K. Khankari	1993	Ph.D.	
C. Telang	2004	Ph.D.		S. Venkatesh	1992	Ph.D.	
K. Chatterjee	2003	Ph.D.		S. Duddu	1992	Ph.D.	
C. Nunes	2003	Ph.D.		A. M. Cicero	1991	M.S.	Chemistry
J. Ping	2003	Ph.D.		D. W. Schultz	1991	Ph.D.	
S. Datta	2003	Ph.D.		S. Wei	1991	Ph.D.	
T. Puhek	2003	M.S.		S. W. Hoag	1990	Ph.D.	
P. Vanchy	2002	M.S.	Food Science	O. Chan	1990	Ph.D.	
Z. Wu	2002	Ph.D.		A.K. Dash	1990	Ph.D.	
T. Zhu	2002	Ph.D.	Chair	M. A. Hedaya	1989	Ph.D.	
P. Minerich	2002	Ph.D.		G. Vojta	1988	Ph.D.	
Z. Peng	2002	Ph.D.		T. Panunto	1988	Ph.D.	
D. Zhou	2002	Ph.D.		S. Khidr	1987	Ph.D.	
C. Sherwin	2002	Ph.D.		D. Vishwasrao	1985	Ph.D.	
T. Zhu	2001	Ph.D.					

Member of the preliminary Ph.D. Committee for:							
Name	Year	Degree Sought	Role/Degree Program	Name	Year	Degree Sought	Role/Degree Program
J. Updyke	2021	Ph.D.		C. Telang	2002	Ph.D.	
J. Sonje	2020	Ph.D.		K. Chatterjee	2002	Ph.D.	
R. Lalge	2020	Ph.D.		C. Nunes	2001	Ph.D.	
K. Jain	2018	Ph.D.		J. Ping	2001	Ph.D.	
N. Kaur	2018	Ph.D.		S. Debnath	2000	Ph.D.	
G. Vreeman	2018	Ph.D.		Y. Gu	2000	Ph.D.	
H. Chen	2018	Ph.D.		D. Zhou	2000	Ph.D.	
K. Wang	2018	Ph.D.		R. Surana	2000	Ph.D.	
Y. Guo	2018	Ph.D.		Z. Peng	2000	Ph.D.	
S. Hu	2017	Ph.D.		T. Zhu	2000	Ph.D.	

K. Amponsah-Efah	2017	Ph.D.		C. Sherwin	2000	Ph.D.	
D. Rautiola	2017	Ph.D.		Z. Wu	1999	Ph.D.	
J. Dun	2017	Ph.D.		P. Kothare	1999	Ph.D.	
S. Vang	2017	M.S.	MS-MDI	C. Sun	1999	Ph.D.	
S. Koranne	2016	Ph.D.		J. Brandt	1998	Ph.D.	
S. Hanson	2016	Ph.D.	Biomed Eng	A. Pyne	1998	Ph.D.	
L. M. Johnson	2016	Ph.D.	Chemistry	L. Musib	1998	Ph.D.	
M. Fung	2015	Ph.D.		H. Song	1998	Ph.D.	
S. Jena	2015	Ph.D.		L. R. Chen	1997	Ph.D.	
W. Sun	2015	Ph.D.	Chair	A. Lakkaraju	1997	Ph.D.	
S. Y. Chang	2013	Ph.D.	Chair	S. Rastogi	1997	Ph.D.	
F. Osei-Yeboah	2013	Ph.D.		S. Pham	1997	Ph.D.	
P. Mistry	2013	Ph.D.		Y. Li	1997	Ph.D.	
M. Mehta	2013	Ph.D.		G. Zhang	1997	Ph.D.	
I. Koonar	2012	Ph.D.		R. Cavatur	1996	Ph.D.	
F. Osei-Yeboah	2012	Ph.D.		R. Bandyopadhyay	1996	Ph.D.	
M. Burcusa	2011	Ph.D.		Z. Yang	1996	Ph.D.	
K. Kothari	2011	Ph.D.		G. Zhang	1996	Ph.D.	
I. Koonar	2011	Ph.D.		L. Musib	1996	Ph.D.	
S. Chatteraj	2010	Ph.D.		L. Chen	1996	Ph.D.	
S. Bhardwaj	2009	Ph.D.		B. W. Cheung	1995	Ph.D.	
S. Krishnan	2006	Ph.D.		H. Zhu	1995	Ph.D.	
S. M. Hanson	2007	Ph.D.		J. Han	1995	Ph.D.	
P. Sundaramurthi	2007	Ph.D.		H. J. Zhu	1995	Ph.D.	
P. Chakravarty	2007	Ph.D.		Y. Lo	1994	Ph.D.	
S. Krishnan	2007	Ph.D.		S. M. Wick	1994	Ph.D.	Chair
E. Lu	2007	Ph.D.		R. C. Brundage	1993	Ph.D.	
D. Chen	2006	Ph.D.		E. A. Sudbeck	1993	Ph.D.	Chemistry
A. S. B. Bhalla	2005	Ph.D.		D. V. Moe	1992	Ph.D.	
S. Bhattacharya	2005	Ph.D.		N. Phadnis	1992	Ph.D.	
Y. Feng	2003	Ph.D.		S. Venkatesh	1991	Ph.D.	
S. Datta	2002	Ph.D.		S. P. Duddu	1991	Ph.D.	
Y. A. Gu	2001	Ph.D.		S. Ghosh	1991	Ph.D.	
P. Ji	2001	Ph.D.		R K. Khankari	1991	Ph.D.	
D. Zhou	2001	Ph.D.		O. H. Chan	1989	Ph.D.	
Z. J. Peng	2000	Ph.D.		S. W. Hoag	1989	Ph.D.	
C. P. Sherwin	2000	Ph.D.		A. K. Shah	1989	Ph.D.	
T. Zhu	2000	Ph.D.		S. Wei	1989	Ph.D.	
P. A. Kothare	1999	Ph.D.		M. A. Hedaya	1988	Ph.D.	
C. C. Sun	1999	Ph.D.		L. E. Riad	1987	Ph.D.	
Z. Wu	1999	Ph.D.		D. W. Schultz	1987	Ph.D.	
J. L. Brandt	1998	Ph.D.	Chemistry	R. K. Schultz	1987	Ph.D.	
Y. Feng	2003	Ph.D.		A.K. Dash	1986	Ph.D.	

TEACHING

Course Administration & Didactic Instruction (selected; past 8 years)	
2014 – current	PHAR 6718: Principles of Drug Delivery II (3 credits) Course Director & Lecturer
2008 – current	PHM 8100: Pharmaceutics Seminar Assessor Course Director (2009, 2016)
2008 - current	PHM 8441: Solubility and Solid-State Properties of Drugs Course Director & Lecturer (2008, 2011, 2014, 2019)

2008 - 2013	PHAR 6162: Principles of Drug Delivery II (3 credits) – course is now PHAR 6718 Course Director & Lecturer
2011, 2009	PHM 8110: Readings in Pharmaceutics (Seminar) Course Director & Lecturer
2008	MedC 5494: Advanced Methods in Quantitative Drug Analysis; Lecturer
2008	Principles of Drug Delivery I Lecturer

SERVICE ACTIVITIES

University (selected)	
1986–present	President's distinguished faculty mentors program. Mentoring of high ability minority undergraduate students.
1993 – 1995	Member of Morse-Alumni Award Selection Committee. This is the highest undergraduate teaching award at the University of Minnesota.
1993–1994	Bush Faculty Development Program on Excellence and Diversity in Teaching. One among the forty eight faculty members selected from the entire University.
1994	Minority Pharmaceutical Research Program. Grant proposal funded by NIH/NCRR, 1994, Principal Investigator: T. Shier, Ph.D.
1986–1990	Summer minority NIH program. In this program, a high school student conducts laboratory research under a faculty member's supervision.
1999–present	Member of the Academy of Distinguished Teachers
College of Pharmacy (selected)	
2020-2021	Chair, Collegiate Review Committee
2020-2021	Faculty Consultative Committee (FCC) Member
2019-present	Member, Salary Equity Review Committee (SERC)
2015	Co-lead (along with Dean Marilyn Speedie) of the Organization and Administration (Collegiate Governance) Accreditation Self-Study Subcommittee.
2001–2003	Accreditation Committee
2008–2009	Didactic Committee member (2008)
2014–2015	
2009 – 2012	Student Affairs Committee; - Chair Elect 2009 - 2010 - Chair 2010 - 2011
2011	National Institute of Child Health & Human Development – Chair of the Biopharmaceutics Working Group
2010	PharmD IV Paper Faculty Committee - Member
2010	Chair, Search Committee for Associate Dean of Research and Graduate Studies
2009	Curriculum Revision Task Force Member
2008	Formulation & PK Support Committee
2008	Member, Faculty Search Committee, Department of Pharmaceutics
1998–2000	Admissions Committee
1995–1996	Chair, Search Committee for Full/Associate Professor of Pharmaceutics
1995–1996	Search Committee for administrative positions within the College of Pharmacy
1994–1995	College of Pharmacy Dean Search Committee
1994–1995	Program Director for the College of Pharmacy Pharmaceutical Care Laboratory Search Committee
1995–1996	General Research Support Committee
1995–1996	Equipment Repair/Replacement Committee
1987–1996	Participant in the Faculty Advising Program, advising 4–8 students per year
1990–1992	Admissions Committee
1991	Civil Service Award Committee
1988–1990	Scholarships, Fellowships and Awards Committee
1986	Search Committee for Assistant Professor of Pharmaceutics

1985–1987	General Research Support Committee
1996–1997	Chair Elect (1996 – 1997)
1985–1986	Search Committee for Assistant Professor of Pharmaceutics
1992 – 2008	Educational Policy Committee member. This committee was responsible for developing the curriculum for the new Pharmacy program (entry level Pharm.D. degree). The curriculum was approved by the College Faculty and implemented in Fall 1995. I had the following additional responsibilities: - Member of the Committee to develop the Core Curriculum - Chair of the Committee to develop a Research Track - EPC Chair Elect 1993 – 1994 - EPC Chair 1994 – 1995 - EPC Chair 2007 – 2008

Service to AAPS or Other Professional/Scientific Organizations (selected)	
2019	Member of the Advanced Photon Source (APS) Structural Sciences Proposal Review Panel. Committee Chair: Jim Kaduk. Review of proposals (>100) requesting beam time at APS. November 11, 2019.
2019	Elected a member of the inaugural Scientific Advisory Board (SAB) for LyoHUB. The goal of Advanced Lyophilization Technology Hub (LyoHub) is to advance the science and technology of freeze-drying/lyophilization. LyoHub's members include companies in the pharmaceutical and food processing sectors, equipment manufacturers and university researchers, who combine their expertise and resources to accomplish the goal.
2018	Member of the Ebert Prize subcommittee of the JPharmSci Editorial Team. The Ebert Prize recognizes the most original and impactful research published in the Journal of Pharmaceutical Sciences.
July 2017	Co-organized, served as a faculty lead, and lectured at a short course on Solid Oral Dosage Forms, delivered at Sun Pharma, Gurgaon, India, from July 16-22, 2017. Faculty from Duquesne University, Long Island University, University of Iowa, University of Maryland - Baltimore, University of Connecticut, and the Illinois Institute of Technology also participated in the short course. The short course was organized through the National Institute for Pharmaceutical Technology & Education (NIPTE).
2017 – present	Founding Co-Director for the University of Minnesota of the NIPTE Center of Excellence for Pharmaceutical Education and Certification, and member of the Curriculum and Certification Committee
2016 – present	Member, IPEC Foundation Scientific Advisory Committee & Selection Committee, International Pharmaceutical Excipients Council (IPEC) Foundation Awards
2009–present	Member, Faculty Committee of the National Institute for Pharmaceutical Technology & Education (NIPTE) - Chair Elect of Faculty Committee in (2014) - Chair of Faculty Committee (2015)
2006–present	University of Minnesota Center Director for the Center for Pharmaceutical Processing Research (CPPR), for which Dr. Sury also organized and hosted the Industrial Advisory Board (IAB) meeting, held in Minneapolis, MN in May 2017, and will host every 1.5 years (postponed to virtual due to COVID-19 impacts)
2007–2010	AAPS Fellows Selection Committee
2008 - 2015	Service on Faculty Committee for the National Institute for Pharmaceutical Technology and Education (NIPTE) and gave presentations at Sun Pharma Tech Training Academy, Vadodara, India 6/15/15; (i) Overview of QbD training program for FDA reviewers & (ii) QbD Case Study
2009	IPrime Executive Committee Member

2002–2003	Chair Elect, Teachers of Pharmaceutics Section, American Association of Colleges of Pharmacy
2003–2004	Chair, Teachers of Pharmaceutics Section, American Association of Colleges of Pharmacy
2004–2005	Past Chair, Teachers of Pharmaceutics Section, American Association of Colleges of Pharmacy
2001–2003	Chair, AAPS Preformulation Section Focus Group
2000–2003	Member, AAPS Finance Committee
1997–1998	Pharmaceutical Technology Section Champion.
November 2–6, 1997	Moderated a podium session entitled “Physical Pharmacy/Solid State Pharmaceutics/Preformulation” on November 4, 1997 at the Twelfth Annual meeting of the American Association of Pharmaceutical Scientists, Boston, MA.
November 2–6, 1997	Moderated a poster session entitled “Physical Pharmacy/Solid State Pharmaceutics/Preformulation” on November 3, 1997 at the Twelfth Annual meeting of the American Association of Pharmaceutical Scientists, Boston, MA.
November 14–18, 1999	PDD Section Paper Screening Committee. Chaired the screening of papers in the area of “Solid-state pharmaceuticals” for presentation at the Fourteenth Annual meeting of the American Association of Pharmaceutical Scientists, San Francisco.
November 2–6, 1997	PDD Section Paper Screening Committee. Chaired the screening of papers in the area of “Solid-state pharmaceuticals” for presentation at the Twelfth Annual meeting of the American Association of Pharmaceutical Scientists, Boston, MA.
July 1997	College of Pharmacy delegate at the AACP Meeting in Indianapolis, IN.

Other Service Activities

2022	Evaluation of the dossier of a faculty member from Trinity College, The University of Dublin for promotion from Associate Professor to Professor (March 2022)
2021	Review of the dossier of a faculty member being considered for promotion to the rank of Professor at the University of Connecticut (August 2021)
2021	Review of a research proposal submitted to the European Science Foundation (ESF), a non-governmental, internationally-oriented, nonprofit association (June 2021)
2018	Review of the dossier of a faculty member being considered for promotion to the rank of Professor at South Dakota State University
2018	Member of the Scientific Committee for the 1st International Conference on Contemporary Pharmacy Challenges: Amorphous Pharmaceuticals and Biopharmaceuticals (ICCPC), held September 9-11, 2018, in Wisla, Poland
2012 -2015	Review of the applications for the AAiPS Research Awards
2012	Poster Judge for the University of Minnesota Rho Chi Research Symposium
2009	Chaperone/Faculty Mentor, 2009 World Food Prize Global Youth Institute, October 15-17, Des Moines, IA
2008 - present	Participated in peer review of the American Association of Government Pharmacy Alumni (AAGCPA) sponsored 2008 Sri Subbaraya Setty Teacher and Research Students (STARS) Award for Teachers. Reviewed nine candidate applications, wrote evaluation for the winning candidate.

Symposium/Short Course Organization

1. Organized a workshop (along with Stephen Byrn, Ph.D.) entitled “Crystallization and polymorphism issues in controlled release dosage forms”, during the 25th International Symposium on Controlled Release of Bioactive Materials, Las Vegas, NV, June 25–26, 1998.
2. Member of the organizing committee of Pharmaceutics and Drug Delivery Section for the fourteenth Annual meeting of the American Association of Pharmaceutical Scientists, San Francisco, November 14–18, 1999 and for the fifteenth annual meeting of the American Association of Pharmaceutical Scientists, Indianapolis, October 29–November 2, 2000.
3. Member of the organizing committee of the Arden House Conference held in January 1999.

4. Member of the organizing committee of the Worldwide Pharmaceutical Powder X-ray Diffraction Symposium. The symposium was organized by the International Centre for Diffraction Data, September 1999.
5. First International Workshop on Physical Characterization of Pharmaceutical Solids, Lancaster, PA, 2000. I was also in the Organizing Committee for the Second International Workshop on Physical Characterization of Pharmaceutical Solids, Lancaster, PA, September 2001 and the Third International Workshop on Physical Characterization of Pharmaceutical Solids, Thame, Oxfordshire, UK, June 9–14, 2002.
6. Program sponsored by the American Association of Colleges of Pharmacy entitled “What are the pharmaceuticals topics/concepts that MUST be taught in the Pharm.D. curriculum and why”, at the 2002 AAPS Annual Meeting and Exposition, Co-moderator: Kenneth Miller, November 10, 2002.
7. Symposium entitled “Phase transformations during pharmaceutical processing” at the 2002 AAPS Annual Meeting and Exposition, Co-moderator: Evgenyi Shalaev, November 13, 2002.
8. Workshop at the National Synchrotron Light Source (NSLS) meeting entitled “Pharmaceutical applications of synchrotron radiation”, Brookhaven National Laboratory, NY, May 17 2004. Co-organizers: Evgenyi Shalaev, Peter Stephens.
9. Roundtable on “Microenvironmental pH on stability and performance of solid oral dosage forms, AAPS Pharmaceuticals and Drug Delivery Conference”, Philadelphia, PA, June 7–9, 2004.
10. Chair of the Planning Committee of the AAPS 40th Annual Pharmaceutical Technologies Conference at Arden House, “Pharmaceutical Materials Science – From Drug Substance to Drug Product”, January 23–28, 2005.
11. Member of the organizing committee of Users Week 2008, “Synchrotron Radiation in Pharmaceutical Science: Freeze Drying and Other Applications”, Argonne National Laboratory, IL, May 4–8, 2008.
12. Organized short course featuring adjunct faculty member Dr. Zheng Jane Li, who presented “Co-crystal APIs in Pharmaceutical Development”, University of Minnesota, Minneapolis, MN, April 30 – May 1, 2009.
13. Member of the Planning Committee of the Pharmaceutical Powder X-ray Diffraction Symposium (PPXRD 8), Glasgow, Scotland, May 4–7, 2009.
14. Chair of a workshop entitled “Characterization of Pharmaceutical Materials”, as part of the Pharmaceutical Powder X-ray Diffraction Symposium (PPXRD 8), Glasgow, Scotland, May 4–7, 2009.
15. Amorphous Pharmaceuticals lecture and case study series, Paddock Labs, Minnesota Job Skills Partnership, July 2007 – October 27, 2010.
16. National Institute of Child Health and Human Development, Pediatric Formulations Initiative (PFI) Workshop, November 1 – 2, 2011, Potomac, MD; Biopharmaceutics working group – chair.
17. Co-chair of the Gordon Research Conference, “Preclinical form and formulation for drug discovery”, Waterville Valley, NH, June 2–7, 2013.
18. Organized (along with Tom Blanton, ICDD) a workshop, “Powder XRD Applications for Pharmaceutical Product Development” in the Pharmaceutical Powder X-ray Diffraction Symposium (PPXRD-15), Hyderabad, India, August 18–20, 2017. This was a satellite meeting to the 24th Congress & General Assembly of the International Union of Crystallography (IUCr 2017).

REVIEWING SERVICE

Editorship & Editorial advisory board membership (selected)		
Dates of Service	Role	Publication
2014 - current	Reviewer	Crystal Growth & Design
2010 – current	Editorial Advisory Board Member	PharmSci, publication of the American Association of Pharmaceutical Scientists
2010 - current	Reviewer	Pharmaceutical Research
2010 - current	Reviewer	International Journal of Pharmaceutics
2010 - current	Editorial Advisory Board Member	Pharmaceutical Development and Technology Published by Informa, London, UK
May 2015 – current	Associate Editor	Molecular Pharmaceutics,
2010 – 2015	Editorial Advisory Board Member,	published by American Chemical Society Publications, Washington, D.C.
2008 - 2013	Reviewer,	
2008 - current	Reviewer	Journal of Pharmaceutical Sciences,
2010 – current	Editorial Advisory Board Member	Publication of the American Pharmaceutical Association John Wiley, Hoboken, NJ
October 1, 2005 – September 30, 2006	Interim Associate Editor	
April 2004 – May 2015	Associate Editor	Journal of Pharmacy and Pharmaceutical Sciences, published by the Canadian Society for Pharmaceutical Sciences, Alberta, Canada
2010 - 2013	Reviewer	Journal of Pharmaceutical and Biomedical Analysis
2008 - 2011	Reviewer	Chemical Engineering Research and Design
2010	Reviewer	Powder Diffraction
2010	Reviewer	Pharmaceutical Development and Technology
2010	Reviewer	PharmSci
2008 - 2009	Reviewer	Journal of Materials Chemistry
Books		
R. Suryanarayanan, Can. Pharm. J., 117, 287 (1984). Review of "Textbook of Biopharmaceutical Analysis" by R.V. Smith and J.T. Stewarts, 1981, published by Lea & Febiger, Philadelphia, PA.		
Conferences		
Papers submitted for presentation at the Sixth National Conference of Undergraduate Research, Minneapolis, MN, March 26–28, 1992.		
Papers submitted to the Pharmaceutics and Drug Delivery section for presentation at the AAPS Eighth Annual Meeting, Orlando, FL, 1993.		
Papers submitted to the Pharmaceutics and Drug Delivery section for presentation at the AAPS Twelfth Annual Meeting, Boston, MA, 1997		