

Steven A. Carlson, Ph.D. Curriculum Vitae

Professional Summary

Dr. Carlson has more than 50 years of experience in technical and business leadership and in product development in the coating, lithium battery and battery separator, data storage, digital imaging, laser imaging, glass fiber optical communication, solar control and security window film, and chemical industries at Route 128 Boston, Manhattan, and Silicon Valley companies. He holds 66 U.S. patents in lithium batteries and in optical materials. Dr. Carlson has been active as a U.S. registered patent agent since 1995 and as an expert witness in patent litigation cases since 2006. Dr. Carlson was selected as the 2022 Inventor of the Year by the New York Intellectual Property Law Association for his inventions of ceramic separators for increased lithium battery safety

Expertise

- Chemistry
- Organic Chemistry
- Coatings
- Lithium Batteries
- Ceramic Type Separators for Safer Lithium Batteries
- Solar Control and Security Window Films
- Glass Fiber Optical Communications
- Photochemistry and Spectroscopy
- Laser Imaging
- Patent Preparation and Litigation

Education

<u>Year</u>	<u>College or University</u>	<u>Degree</u>
1973-1975	Brown University, Providence, RI	Postdoctoral Research Associate ▪ Instructor in organic chemistry laboratory ▪ Research in photochemistry
1969	Massachusetts Institute of Technology, Cambridge, MA	Ph.D. Organic Chemistry ▪ Chapin Fellowship (1967 – 1968) ▪ Thesis: Photochemistry of Anthraquinone and Related Compounds
1965	Principia College, Elmhurst, IL	B.S. Chemistry with Highest Honors ▪ Petroleum Research Fund Scholar (1964)

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Professional Experience

From: January 2024
To: Present
Organization: Self-employed
Experience: Consultant for a US lithium battery company and Technical Advisor for a US advanced aerogel insulation panel company

From: January 2001
To: December 2023
Organization: Optodot Corporation, Devens, MA (acquired by Meta Materials, Inc. in June 2022)
Title: Co-Founder, President & CEO at Optodot; Executive Vice President and General Manager, Advanced Materials & Battery Products, at Meta Materials

Summary:

- Developed thin sol gel separators for lithium ion batteries with improved safety, lighter weight, lower cost, and new lower cost manufacturing. Over 40 U.S. patents and over 60 foreign equivalents that cover this technology have issued.
- Developed nanoscale glass fiber optical communication systems, infrared reflecting solar and security window films, laser imageable infrared security markings, organic photovoltaic cells, and optical chips. Over 45 U.S. and foreign equivalent patents that broadly cover this technology have issued.
- Obtained seed round funding in January 2001.
- Achieved revenues on window films and infrared security markings starting in July 2004 with increasing revenues to present.
- Was the Principal Investigator on SBIR Phase I, II, and III grants from the DoD for heat resistant separators, on a DOE contract for low cost lithium batteries, on SBIR Phase I and Phase II grants from the DOE for low cost battery separators, on a SBIR Phase I grant from the DOE for safety shutdown separators, and on SBIR Phase I and Phase II contracts from DoD for nanoscale optical chips.
- With Optodot's approval, provided expert witness services on both validity and infringement for three patent litigation cases (see below).

From: 1996
To: 2001
Organization: Moltech Corporation (now Sion Power Corporation), Tucson, AZ
Title: Director of Materials Development and Director of Business Development
Summary:

- Member of the senior management team for this privately-held 80-person lithium battery company.
- Directed development of new battery coatings with breakthroughs achieved in

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using nanoporous sol gel materials as separators and in new lightweight battery designs. Inventions include 13 issued patents for advanced lithium batteries. All of these patents and their 8 foreign equivalents were exclusively licensed to Optodot Corporation in 2007.

- Did preparation, filing, and prosecution of U.S. and foreign patents for Moltech in the field of advanced lithium batteries. More than 45 patents prepared, including more than 30 patents that have issued in the U.S.
- With Moltech's approval, continued part-time patent practice at Sampson & Associates, P.C., Boston, MA, as a registered patent agent starting in 1996. Did preparation, filing, and prosecution of U.S. and foreign patents for clients in chemical-related fields, including laser-imaged and laser-ablated printing plates, sensors, optical switches, and analytical methods. More than 15 patents prepared, including more than 10 patents that have issued in the U.S.

From: 1989
To: 1996
Organization: Rexam Graphics (formerly James River Graphics and later Intellicoat), South Hadley, MA
Title: Director of Business Development, Director of Marketing, and Director of Product Research
Summary:

- Member of 6-person senior management team that ran this company with \$150 million annual sales.
- Directed projects on ink jet and wax thermal transfer imaging products, laser ablation imaging, and pigment dispersions.
- Led laser ablation transfer (LAT) imaging project for printing plates and proofing that produced two broad patents and supporting technology that won "Best Paper" in the top imaging journal.
- Initiated the successful sale of this LAT technology to a large imaging company.
- Led R&D group that designed improved transparency films that led to a major OEM business with about \$20 million annually of high margin sales.
- Led R&D group that did sol gel coatings for ink jet and other imaging products.
- Established and led five-person Marketing Department which achieved its primary goal of 35% or \$50 million growth in sales from new products within 3 years.

From: 1986
To: 1989
Organization: Xidex Corporation (later Anacom Corporation), Santa Clara, CA
Title: Director of Technology
Summary:

- Chief technical officer for this company with over \$600 million in annual sales.
- Obtained \$7 million in capital and \$3 million in R&D budget and directed design

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and startup production of 3480 ½” computer tape manufacturing.

- Obtained \$4 million in capital and \$2 million in R&D budget and managed entire 3.5” microfloppy disk technology and factory automation program.
- Directed product designs and startup production for all types of 3.5” and 5 ¼” flexible disk coatings for the world’s largest manufacturer of flexible disks.
- Directed quality assurance program for magnetic media business with \$200 million in annual sales.
- Managed R&D and quality assurance staff of 52 people.
- Completed development and startup production of 3480 ½” computer tape manufacturing, including plastic cartridge design and production, with a buildup to a 90 person production staff, in only five months. CEO and the Board of the company considered this to be the best engineering program ever done in the history of Xidex. Product became #2 in worldwide sales with no history of product recalls that plagued two major competitors.
- Completed automated production facility for 3.5” microfloppy disks that increased volumes over 50-fold while greatly improving quality.
- Completed development and full production of 3.5” and 5 ¼” flexible disk coatings in 6 months with greatly improved quality and no history of product recalls. Products became #2 worldwide in sales of flexible disk coated media.

From: 1984
To: 1986
Organization: Memorex Corporation, Santa Clara, CA
Title: Manager, Development Engineering, Computer Tape Division
Summary:

- Member of 5 person management team running this division with annual sales of \$100 million.
- Managed development of production equipment and processes and of plastics for 3480 ½” tape cartridges from engineering design to initial production.
- Managed R&D staff of 30 in development of magnetic tapes for ½” computer tapes and for instrumentation tapes for #2 company in computer tapes.

From: 1982
To: 1984
Organization: Ampex Corporation, Redwood City, CA
Title: Manager, Long Range Research, Magnetic Tape Division
Summary:

- Directed 10 person research team leading to advanced commercial coatings for video, audio, and instrumentation tapes.
- Directed research programs and participated in quarterly joint technical reviews as part of joint venture in video and audio tapes between Ampex and Konica Corporation in Japan.

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- Made a number of trips to Konica in Japan to review their R&D and factory operations.
- Developed extensive technology base for metal particle magnetic media and for electron beam cured magnetic coatings.

From: 1979
To: 1982
Organization: GAF Corporation (now Ashland Inc.), Wilmington, DE
Title: Manager, Market Development
Summary:

- Managed ten person corporate new business development group for company with over \$1 billion in sales.
- Achieved new product introductions of single ply roofing, electron beam resists, thermoplastic elastomers, radiation curable coatings, and textile print thickeners.

From: 1976
To: 1979
Organization: Keuffel & Esser Company (later Azon and now Intelicoat), Morristown, NJ
Title: Research Manager
Summary: Managed 22-person diazo reprographic and drafting product R&D group that achieved product design and commercial production of seven new product lines: drafting films; diazo sensitized drafting films; drafting papers; xerographic transparency films; erasable sepia papers; diazo copy cards; and diazo microfilms. These new products achieved a #1 market share of diazo and drafting media for this company with \$100 million annual sales. New higher performance design more than doubled the market share of drafting films to a #1 position at a 35% share.

Prior Academic and Industrial Experience

From: 1969
To: 1976
Summary:
1975 – 1976 St. Regis Paper – Senior Development Chemist
1973 – 1975 Brown University, Providence, RI

- Two years of postdoctoral research in photochemistry and free radical reactions and lecturing in organic chemistry.

1971 – 1973 Arkwright, Inc. – Manager R&D
1969 – 1971 Itek Corporation – Senior Chemist

Litigation Support Experience

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Expert Engagement:

Type of Matter: Patent Infringement
Law Firm: Amster, Rothstein & Ebenstein, LLP, New York, NY
Case Name: Presstek, Inc. v. Creo, Inc. and Creo Americas, Inc., Civil Action No. 05-CV-65-PB
Services Provided: With Optodot's approval, provided expert witness services, which included testimony under deposition, in case involving laser imageable lithographic printing plates
Disposition: Undisclosed
Date: 2006 – 2008

Expert Engagement:

Type of Matter: Patent Infringement
Law Firm: Amster, Rothstein & Ebenstein, LLP, New York, NY
Case Name: Presstek, Inc. v. VIM, ITC Case No. 337-TA-636
Services Provided: With Optodot's approval, provided expert witness services for both validity and infringement, which included testimony under deposition and court testimony, in case involving laser imageable lithographic printing plates
Disposition: ITC final decision in favor of client (Presstek)
Date: 2008 – 2010

Expert Engagement:

Type of Matter: Patent Infringement
Law Firm: Amster, Rothstein & Ebenstein, LLP, New York, NY
Case Name: TSI v. Azbil BioVigilant, Case No. CV 12-00083-PHX-DGC
Services Provided: With Optodot's approval, providing expert witness services for both validity and infringement in case involving fluorescence detection of biological particles
Disposition: Final decision in favor of client (Azbil BioVigilant)
Date: 2012-2015

Professional Affiliations, Achievements & Awards

- Invited speaker at more than 10 technical conferences, including at the First and Third International Forum on Electrolytes and Separators for Advanced Batteries in Nov. 2015 in Shenzhen, China, and in Oct. 2017 in Nanjing, China, respectively, and The Battery Show in Novi, Michigan, in Sept. 2016.
- Chapin Fellowship, 1967-1968, MIT

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- Petroleum Research Fund Scholar, 1964

Patents & Publications

66 U.S. patents and 80 foreign equivalents issued since 1999 in the fields of lithium batteries, separators for batteries, infrared optical materials, solar control and security window films, and anti-counterfeiting security markings, including the patent below on laser imaging.

Steven A. Carlson et al., "Dual Vesicular and Infrared Imaging Media," U.S. Pat. No. 9,266,373.

Publications

Four research publications on photochemistry and spectroscopy in major journals, including the discovery of the unique infrared absorption properties of anthrasemiquinone neutral free radicals and free radical anions and of the delayed thermal fluorescence of anthraquinone in solution.

1. Steven A. Carlson and David M. Hercules, *Journal of the American Chemical Society* **1971**, 93, 5611.
2. Steven A. Carlson and David M. Hercules, *Photochemistry and Photobiology* **1973**, 17, 123.
3. Steven A. Carlson and David M. Hercules, *Analytical Chemistry* **1973**, 45, 1794.
4. Steven A. Carlson and David M. Hercules, *Analytical Chemistry* **1974**, 46, 67.