

Karey L. Holland, Ph.D.

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KEY STRENGTHS:

- Strong Problem Solving, Innovation and Analytical Skills
- Innovative, IP Savvy
- Customer Focused: Listens & Understands Needs, then Champions these Needs for the Customer
- Extensive Ties to Fab Process Technologists and Supplier Engineering and Management Worldwide
- Communicates Effectively Products Strengths, Capabilities and Attributes
- IC Process Expert: Logic & Memory Roadmaps Beyond 2nm – Implications to Each Business Segment
- Highly Experienced in Communications; Presentations to Diverse and International Audiences

PAIRODOCS

Consulting

4-2022 to Present

Contract work with Techcet CA, LLC supporting semiconductor technology roadmaps and wafer forecasting to > 5 years in the future. Author of the annual photolithography materials report produced for the Critical Materials Council and related separate consulting requests related to photolithography. Also, author of CMP ancillaries annual report. Separately – Consulting support for two new CMP start-ups.

REVASUM

Chief Technology Officer

9-2021 to 4-2022

Develop Technology Roadmap for SiC Polish Equipment to meet customer expectations. Managed engineering and process team to improve polish tool throughput and quality through improve consumables, cleaning technologies, and more.

EDWARDS VACUUM (ATLAS COPCO)

2018 to 9-2021

SubFab and Abatement Systems

Global Market Sector Mgr- Process Technology

Develops 2 to 7 year Technology Roadmap for Logic and Memories – new materials & processes that may challenge Edwards pumps or abatement systems, based on information from R&D and OEMs. Develop priorities, work with internal stakeholders plan to address highest priorities, including novel technologies. Customer (Fab, R&D and OEMs) needs advocate, finding new needs and pushing Edwards to pursue (e.g. materials recovery and reuse). Developed detailed training materials and teach classes on technology roadmaps, and detailed process flows to train non-fab experienced engineers.

MEGA FLUID SYSTEMS, INC (MFS)

2014 to 2018

CMP & Chem Distribution Technology Roadmap & Vice-President Process Technology

Developed 5-year Technology Roadmap for materials and analytics challenges, developed priorities, created R&D plan to address highest priorities, including novel technologies.

Worked closely with customers & co-suppliers to get their concerns, priorities, feedback and buy-in.

Manage and contribute to R, D & T for CMP Slurry & Chemical Handling Equipment development, including technology related to analytics and In-Field Customer Problem Solving. Understand customer needs and translate to system requirements & capabilities, develop technical roadmaps, and develop IP.

Account Manager for New IDM Account in Oregon. Developed relationships and Successfully Engaged New Program with Customer to be “Preferred Supplier”. MFS Account Manager for “bleeding edge” IDM.

FEI Company

2011-2014

Sr. Manager Strategic Technical Roadmaps/Marketing and IP Development

Developed long range electronics business technical strategy, based on Semiconductor technology roadmaps and processes from current to 5+ yrs out. Translated to anticipated customers’ needs and effectively communicated back to customers and to sales, marketing, engineering, advanced technology, CTO, CEO, and finance. Worked closely with engineers to develop techniques in advance of customer demands. Significant interaction with key IC fab process technologists including international customers on long range product needs. Drove IP development focused on generating stronger products & margins with IP.

TECHCET, LLC. Returned to Consulting business during industry downturn

2009 – 2011

Included one Expert Witness Project with Applied Materials

NEXPLANAR CORPORATION**2007-2009****CMP Pad Start-Up****Vice-President and Chief Technical Officer**

Managed and contributed to R, D & T for CMP pad development, including technology related to polymer and filler materials. Understood product technical capabilities and translated to customer needs, developed technical roadmaps, and developed and secured IP. IP Development included landscaping hundreds of patents and mapping a clear route for new CMP pad IP, that also resulted in a pad with outstanding performance for customers.

TECHCET, LLC.**Consulting Co-Founder and Partner****1999 - 2007**

Patent expert witness for > 4 patent infringement cases. Defined new product opportunities and initial Fab customer business for > 10 Client Companies. Materials business development work includes lithography, solar, nanotechnology, high k and low k dielectrics, plating and sputter metals, and CMP. Obtained technical requirements from worldwide semiconductor device fabricators, developers and equipment OEMs and use this to develop products for materials suppliers, with emphasis on understanding customer requirements and priorities: performance, integration, cost, yield, and schedules. Contracts with Silecs, Shape Product, Silbond, Huber, NanoBlox and Silco as Market/Technology expert and manager. Presentations to diverse audiences, including ISS and SMC.

Consulting Contracts that were > 1 year Included:**BOC-EDWARDS****Technology Applications through Techcet Contract**

Defined customer pull and requirements for new BOC-E flow controller by rationalizing end users, OEMs, and BOC-E knowledge (CMP specific). Worked with corporate CTO and staff to define technical/business strategy for CMD. Delivered 5 technology status and forecast assessment reports on many applications in the IC industry related to chemical management opportunities, including CMP and immersion photolithography.

RIMPAD AMERICA, INC.**Contract CTO & Vice President Technology**

RimPAD was an IC consumables start-up company developing "IC1000-clone" chemical mechanical polishing pads. Defined customer expectations, understood product technical capabilities, developed technical sales presentations, met with potential customers and partners, and developed and secured IP.

NANOBLOX, INC.**Start-Up Team Member**

Start-up company developing applications for a 3 to 5 nm carbon-based particle. Responsibilities included managing researchers to develop necessary data, working with VC to procure funding, and meeting with potential partners and customers.

THOMAS WEST INC.**CTO & Vice President Technology**

Member of the senior staff involved in overall Thomas West Inc (TWI) decisions. Work closely with semiconductor device development and manufacturing technologists to understand their short term and long term requirements for CMP pads and overall technical performance. Supported sales calls with technical presentations and in depth discussions. Developed tactical and strategic technology plans that addressed customer needs and defined areas to exploit TWI's competitive advantage. Initiated intellectual property program (previously no patents or formal method of dealing with IP). Managed field applications engineering team. Wrote numerous papers, including the TWI vision "authored" by the company owner.

NOVA MEASURING INSTRUMENTS LTD. (Nasdaq: NVMI)**Member of Board of Directors, Member of Strategy Committee and Audit Committee****SPEEDFAM – IPEC and INTEGRATED PROCESS EQUIPMENT CORP. (IPEC)****1994-1999****IPEC & SpeedFam IPEC were CMP OEMs, later acquired by Novellus****Chief Technical Officer and Vice-President**

- Technical Interface to Customers
- Technology Roadmap Definition & Implementation
- Technical Strategic Alliances
- Adv. Tech. Development Projects Management
- Intellectual Property Tactics & Strategy
- Technical Spokesperson to Financial Community

Vice-President of Process Technology**Director of Process Technology**

Adv. CMP Process Development & Process Integration with Co-Suppliers

CMP Process Development, on Site Demonstrations, and Field Applications Support

MOTOROLA MMTG Manufacturing Planning & Strategy Manager**1993-1994**

Real-time Allocation, Rationalization and Planning for MMTG Wafer, Assembly and Test Capacity

Planning for World Wide Wafer Fabrication, Assembly and Test Manufacturing

5 year Group Manufacturing Plan (World Wide Wafer Fabrication, Assembly and Test)

IBM**1981-1993****SEMATECH ADVANCED EQUIPMENT DEVELOPMENT, PROGRAM MANAGER****Micrascan II 0.35 mm Lithography System (Expose Tool, Resist and Tracks)**

Development and Evaluation of Micrascan II Equipment

Best of Breed Analysis for SEMATECH Member Companies

Strategic and Tactical Management of SVGL Program: Technical and Business Issues

Equipment Burn-In Manufacturing Stress Simulation, Equipment Evolution for 0.25 mm Generation

TECHNOLOGY DEVELOPMENT AND MANUFACTURING IMPLEMENTATION**Manager, 0.5 mm CMOS 16 Meg DRAM Process**

Deep-UV Resist Process and Materials; Dielectric Deposition & Etch Development

Micrascan I, Nikon Excimer, Metrology, Etch and Deposition Equipment Optimization

Engineering, 0.7 mm CMOS 4 Meg DRAM Interconnect Technology

Novel Planarized Tungsten Ground Rules and Reliability

Lithography and Etching of Oxide, Tungsten and Aluminum Alloys

Dielectric Deposition and Etch

Engineering, 1.2 and 1.0 mm CMOS Logic Interconnect Technology

Interconnect Process Ground Rules and Photolithography, Metal Patterning, Lift-Off and Etch Development

EDUCATION

Ph.D. - BioAnalytical Chemistry, The Pennsylvania State University

M.S. - BioAnalytical Chemistry, Purdue University

B.A. - Chemistry, Albion College

ADDITIONAL CREDITS & ACTIVITIES

Outstanding Technical Achievement Award, IBM

Mentor to many university graduates and post-graduates & Ph.D. Recruiter to Universities

> 8 Patents; Numerous Publications and Presentations throughout the world

Karey Holland, PhD – Awards, Publications and Patents

Awards

Deep-UV Lithography Program Manager - Outstanding Technical Achievement Award, IBM 1991

Publications related to Lithography

Techcet Critical Materials Council Report on Photolithography Materials. Quarterly updates started 6/2022 and full report of 2023 will be released soon.

Publications listed on Research Gate

- Litho related (IBM kept our 248nm DUV litho a secret during the time I developed the program and managed the team – so it wasn't until 1990 that we were allowed to publish)
- Manufacturing with DUV lithography, 1997 IBM Journal of Research and Development
- Performance of a 0.5 NA broadband DUV step-and-scan system, 1993 SPIE
- Isolated-grouped linewidth bias on SVGL Micrascan, 1993 SPIE
- Positive DUV resist (APEX-E) by IBM for SVGL Micrascan, 1993 SPIE
- Manufacturing implementation of deep-UV lithography for 500-nm devices, 1992 SPIE
- Deep-ultraviolet lithography for 500-nm devices, 1990 SPIE

Publications Beyond Lithography:

- Characterization of Slurry System and Suppression of Oxide Erosion in Aluminum CMP, Materials Research Soc 2011
- Characterization of thermoset and thermoplastic polyurethane pads, and molded and non-optimized machined grooving methods for oxide chemical mechanical planarization applications, Thin Solid Films 2009
- New materials: Is the risk worth the reward?, Solid State Tech 2005
- Continuing trends force materials suppliers to keep the lid on costs, Solid State Tech 2004
- Improving cost of ownership and performance of CMP process and consumables, Micro 2002
- Chapter 2 Equipment in Book: Semiconductors, 2000
- Selectivity switch concept in Cu chemical mechanical planarization and its implementation on orbital tools, Journal of vacuum science & technology 1999
- Optical endpoint detection for chemical mechanical planarization, Journal of vacuum science & technology 1999
- A Static Model for Scratches Generated during Aluminum Chemical-Mechanical Polishing Process: Orbital Technology, Japanese Journal of Applied Physics 1999
- Cu CMP with orbital technology: summary of the experience, ASMC 1998
- Endpoint detection for CMP, Journal Electronic Materials 1998
- CMP CoO reduction: Slurry reprocessing, Thin Solid Films 1997

- Film thickness measurements for chemical mechanical planarization, Solid State Tech 1996
- Von Mises Stress in Chemical Mechanical Process, Electrochem Soc, 1997
- Stress distribution in chemical mechanical polishing, Thin Solid Films 1997
- Submicron wiring technology with tungsten and planarization, IEDM 1988
- Electrochemistry of Protoporphyrin IX Compared to Synthetic Models, Chapter, 1982
- Amperometric Methods for Oxidoreductase Enzymes Based on Liquid Chromatography with Electrochemical Detection. Alcohol Dehydrogenase, 1979

Patents

- US4786360A (IBM) Anisotropic etch process for tungsten metallurgy
- US4919750A (IBM) Etching metal films with complexing chloride plasma
- EP0188735B1 (IBM) Tailoring of via-hole sidewall slope in an insulating layer
- EP0309773B1 (IBM) Method of plasma etching metals that form usually low volatility chlorides
- US6234883B1 (IPEC) Method and apparatus for concurrent pad conditioning and wafer buff in chemical in chemical mechanical polishing
- US9375823B2 (NexPlanar) Grooved CMP pads
- EP2904633B1 (FEI) Multidimensional structural access
- US6261158B1 (Speedfam-IPEC) Multi-step chemical mechanical polishing

Karey Holland, PhD.
Patent Cases

- 2006-2010 DuPont Air Products Nanomaterials LLC v. Cabot Microelectronics Corp. Morgan Lewis Bockius (John Gorman, Arthur Antonelli, Victor Balancia); Chemical Mechanical Planarization (CMP). Action for declaratory judgment of noninfringement. expert report, deposition, case settled in favor of client.
- 2006: AMAT v. TSK Accretech); Goodwin Procter; CMP equipment, materials, and process patents; expert report, deposition, case settled in favor of client.
- 2005: Toshiba v. Hynix; Townsend, Townsend and Crew; CMP process patents; expert report, deposition, case settled in favor of client.
- 2004: TSMC v. SMIC; with Kekar & VanNest; CMP process patents; expert report, deposition, case settled in favor of client.
- 2000: Siemens v. Hyundai; Kekar & VanNest; CMP process patents; expert report, deposition, case settled in favor of client.