

Ijaz H. Jafri, Ph.D. has over ten years technical hands-on experience in engineering management, electromechanical design and analysis, device fabrication, sales and marketing, applications development and customer support. He holds eight US patents and has numerous journal and conference publications. He is well recognized for ability to develop programs and funding from government, private and emerging market sectors.

PROFESSIONAL EXPERIENCE

HONEYWELL INTERNATIONAL CORPORATION, REDMOND, WA

2003 to date

Principal Engineer

Provide leadership for development of new design and fabrication methods based on microelectromechanical systems (MEMS) technology.

- Appointed lead engineer for developed of proprietary MEMS technology for sensors and actuators.
- Filed two invention disclosures.

CORNING INCORPORATED, WILMINGTON, MA

2000 to 2003

Engineering Manager - Electromechanical Design and Applications

Directed electromechanical design and analysis programs. Supervised engineering design and applications group. Business team member responsible for independent profit and loss for IntelliSuite[®] Software business division.

- Appointed lead technical design engineer on projects utilizing Microelectromechanical Systems (MEMS) technology in the fields of communications, life sciences and microinstrumentation for development of MEMS based sensors and actuators.
 - Responsible for design and analysis for improving reliability of MEMS RF switches on DARPA funded (via subcontract) MEMS Improvement Program (MIP).
 - Developed patent pending ultra-fast single axis optical switch for spatial light modulator application.
 - Conducted design analysis on wavelength selective MEMS optical switch leading to improved reliability and ahead of schedule delivery.
 - Developed high power MEMS RF switch on schedule.
 - Conducted design and analysis on ATP funded (via subcontract) program for development of conductometric gas sensors.
 - Developed thermally actuated high power microrelay.
 - Filed numerous invention disclosures in MEMS technology on proprietary programs.
- Lead applications engineering group responsible for sales, marketing and technical support of Corning IntelliSense's FEA/BEA design and analysis software for MEMS – IntelliSuite[®].
 - Instrumental in software sales to emerging markets in Asia.
 - Formulated ISO procedures for customer support resulting in increase in sales of renewal licenses.
 - Developed roadmap, feature requirements and industrial needs leading to increased sales in RF MEMS and microfluidics sectors.
 - Submitted successful proposals for conducting feasibility and prototype fabrication projects resulting in increased revenue for software division.

GT EQUIPMENT TECHNOLOGIES, INC., NASHUA, NH

1996 - 2000

Applications Manager Research and Development Engineer

Provided leadership for development of new technologies and systems for semiconductor and solar industries. Secured funding from federal agencies (EPA, NSF and DoD) through SBIR programs by serving as PI/Co-PI to conduct innovative research for commercialization.

- Developed patented technology for bulk polysilicon (for feedstock) production using CVD on tubes, which was successfully licensed to a large European company for production.
- Developed patented systems and processes using Supercritical Carbon Dioxide technology for semiconductor and microelectromechanical systems (MEMS) industries.
- Developed proprietary technology for low cost solar cell production directly from metallurgical-grade silicon (MGSi) that bypasses the need of silanes, tri-chlorosilanes and other chemicals.
- Developed patented high pressure system for synthesis and bulk growth of compound semiconductor (InP, GaAs) crystals, which was highlighted by AFOSR as a successful technology transfer program.
- Developed patented single wafer critical point drying process and system for MEMS technology, which eliminates stiction problem associated with surface micromachined MEMS devices.
- Formed strategic alliances and collaborations with various research laboratories (Sandia National Laboratories, Los Alamos National Laboratories, National Renewable Energy Laboratory, USAF Research Laboratory at Hanscom AFB, Sarnoff Corporation, Corporation for National Research Initiative, New York State Center for Thin Film Deposition), universities (SUNY at Stony Brook, University at Albany, University of New Hampshire), and industries (M/A-Com, IBM etc.).
- Participated in trouble shooting and changing mechanical and electrical system components.
- Performed thermal modeling and analysis using CFD codes for various manufacturing processes and system design.
- Initiated and developed the LAN/WAN and Internet access for the company.

PROCESS MODELING LABORATORY
STATE UNIVERSITY OF NEW YORK AT STONY BROOK

1993 - 1996

Teaching/Research Assistant

- Developed 2D CFD code for Czochralski (Cz) Crystal Growth process in FORTRAN.
- Experimental/Computational analysis of feasibility of continuous Cz process for Si growth.
- Developed 2D boundary layer CFD code for non-Newtonian fluids.
- Performed numerical and experimental studies of fluid mechanics and heat transfer associated with non-Newtonian fluids.

SKILLS

Software (FEA): ABAQUS, IntelliSuite®, Various CFD codes

Software (other): MS - Project, Access, Office, Publisher, AutoCAD, Tecplot, Fieldview, Grapher

Languages: FORTRAN, PASCAL, and BASIC

Hardwares: IBM-PCs, SGI Indigo2, SUN Solaris, IBM RS 6000

EDUCATION

Doctor of Philosophy (Mechanical Engineering)

State University of New York at Stony Brook, Stony Brook, NY

Concentration: Thermal Sciences and Fluid Mechanics. Minor: Design and Solid Mechanics

Dissertation Title: *"Modeling and Design of an Advanced Bulk III-V Compound Synthesis and Crystal Growth System"*.

Master of Science (Mechanical Engineering)

State University of New York at Stony Brook, Stony Brook, NY

Concentration: Manufacturing Engineering

Research Title: *"Continuous Czochralski Crystal Growth Process"*.

Bachelor of Science (Mechanical Engineering)

New York Institute of Technology, Old Westbury, NY

Concentration: Aerospace Engineering

Senior Project: *"Design of a Solid Propellant Rocket"*.

PATENTS

- US 6,019,841: "Method and apparatus for synthesis and growth of semiconductor crystals".
- US 6,067,728: "Supercritical phase wafer drying/cleaning system".
- US 6,284,312: "Method and apparatus for chemical vapor deposition of polysilicon".
- US 6,334,266: "Supercritical fluid drying system and method of use".
- US 6,365,225: "Cold wall reactor and method for chemical vapor deposition of bulk polysilicon".
- US 6,508,259: "Inverted pressure vessel with horizontal through loading".
- US 6,602,349: "Supercritical fluid cleaning process for precision surfaces".
- US 6,612,317: "Supercritical fluid delivery and recovery system for semiconductor wafer processing".
- US 2003/0137716: "Tilting mirror with rapid switching time" (pending).

PUBLICATIONS (JOURNAL)

- "A high fill factor linear mirror array for a wavelength selective switch", with W. Taylor, J. Brazzle, A. Bowman-Osenar, C. Corcoran, D. Keating, G. Kirkos, M. Lockwood, A. Pareek and J. Bernstein; *Journal of Micromechanics and Microengineering*, **14**, 147-152 (2004)
- "Optical fiber interferometer for measuring the in-situ deflection characteristics of microelectromechanical structures"; with T. Tayag, E. Kolesar, B. Pitt, K. Hoon, and J. Marchetti; *Journal of Optical Engineering*, **42(1)**, 105-111, (2003)
- "Simulations based design for a large displacement electrostatically actuated microrelay"; with G. Chong, K. Hoon, and D. Keating; *Journal of Analog Integrated Circuits and Signal processing*, **32**, 37-46, (2002)
- "Enhanced bulk polysilicon production using silicon tubes"; with M. Chandra, H. Zhang, V. Prasad, C. Reddy, C. Amato-Wierda, M. Landry, T. Ciszek; *Journal of Crystal Growth*, **225**, 330-334, (2001)
- "Improved phosphorous injection synthesis for bulk InP", with W. Higgins, G. Iseler, D. Bliss, G. Bryant, V. Tassev, R. Ware, D. Carlson; *Journal of Crystal Growth*, **225**, 225-230, (2001)
- "The Evolution of Laminar Jets of Herschel-Bulkley Fluids"; with G. Vradis; *International Journal of Heat and Mass Transfer*, **41**, 3575-3588, (1998).
- "Role of Crucible Partition in Improving Czochralski Melt Conditions"; with V. Prasad, K. Gupta and A. Anselmo; *Journal of Crystal Growth*; **154**, 280-292 (1995).

CONFERENCE AND OTHER PUBLICATIONS / PRESENTATIONS

- "Design and Analysis of MEMS / MST based Radio Frequency Switches", with M. Farina, *MST News*, **4/03**, 12-13, (September 2003).
- "Microelectromechanical System (MEMS) based advanced high performance radio frequency systems", Invited presentation, *International Bhurban Conference of Applied Science and Technology*, June 16-21, Pakistan (2003)
- "Coupled electromechanical and Full wave electromagnetic analysis of micromachined electromechanically tunable capacitors", with M. Farina and D. Keating; *International Bhurban Conference of Applied Science and Technology*, June 16-21, Pakistan (2003)
- "Fully coupled computational modeling of transport phenomena in microfluidics applications", with A. Chatterjee; *International Bhurban Conference of Applied Science and Technology*, June 16-21, Pakistan (2003)
- "Full wave analysis and electromechanical characterization of tunable capacitors", with M. Farina, T. Rozzi and D. Keating; *IEEE AP-S International Symposium and USNC/CNC/URSI National Radio Science Meeting*, June 22-27, Columbus, Ohio (2003)
- "Electromechanical and electromagnetic analysis of two and three-plate voltage-controlled oscillators (VCOs) with micromachined tunable capacitors", with D. Keating and M. Farina; *Design Test, Integration and Packaging of MEMS and MOEMS*, France, (May 2003).
- "Experimental investigation, modeling and simulations for MEMS based gas sensor used for monitoring process chambers in semiconductor manufacturing", with F. DiMeo, J. Neuner, S. DiMascio, J. Marchetti; *MEMS Design, Fabrication, Characterization and Packaging*, UK, *SPIE Proceedings*, **4407**, 35-44 (2001).

- Simulations based design for a large displacement electrostatically actuated microrelay”, with G. Chong, K. Hoon, and D. Keating; Design Test, Integration and Packaging of MEMS/MOEMS, France, *SPIE Proceedings*, **4408**, 254-262 (2001).
- “Improved Phosphorous Injection Synthesis for Bulk Indium Phosphide”, with W. Higgins, G. Iseler, D. Bliss, G. Bryant, V. Tassev, R. Ware, and D. Carlson; *12th IPRM Conf.*, Williamsburg, VA, (2000).
- “Photoresist Stripping with CO₂-Based Supercritical Fluids”, with H. Moritz, D. Mount and J. Rubin; Third International Symposium on Environmental Issues with Materials and Processes for the Electronics Semiconductor Industries, The Electro Chemical Society, 197th Meeting - Toronto, Ontario, Canada, May 14-18, 2000
- “Application of Supercritical CO₂ for Photoresist Stripping”, with H. Moritz, D. Mount, J. Rubin, J. Barton; *SEMATECH: Wafer Cleaning and Surface Preparation Workshop*, Austin, TX, (2000).
- “Enhanced Bulk Polysilicon Production using Silicon Tubes”, with M. Chandra, H. Zhang, and V. Prasad; *NSF Design and Manufacturing Research Conference*, Vancouver, BC, Canada, (2000).
- “Critical Point Drying and Cleaning for MEMS Technology”, with H. Busta, and S. Walsh; *Micromachining and Microfabrication SPIE*, **3880**, 51-58 (1999).
- “Supercritical Carbon Dioxide Drying and Cleaning: Application to MEMS Technology”, with H. Moritz, H. Busta, and S. Walsh, *MST News*, **2/99**, Euro 20, 15-20, (1999).
- “Applications of Supercritical Carbon Dioxide for Semiconductor and MEMS Processing”, with H. Busta, J. Rubin, and J. Barton; *IEEE-IEMT Symposium*, Semicon Southwest, TX (1999).
- “A New High Pressure In-situ Synthesis and Crystal Growth System for Large Diameter III-V Compound Semiconductors”, with V. Prasad, D. Bliss, G. Bryant, K. Gupta, M. Chandra, and H. Zhang; *AACGE-11*, Tucson, AZ (August 1999).
- “Design of a New High Pressure Crystal Growth System for III-V Compound Crystals”, with H. Zhang, K. Gupta, V. Prasad, D. Bliss, R. Farmer, and M. Chandra; *ICCG-12/ICVGE-10, Jerusalem, Israel* (July 26-31, 1998), *ACCGE- East 97* NJ, September 1997.
- “A New High Pressure System for Synthesis and Crystal Growth of Large Diameter InP”, with D. Bliss, G. Bryant, V. Prasad, K. Gupta, R. Farmer, and M. Chandra; *10th Int. Conf. on InP and Related materials*, Tsukuba, Japan (May 11-15, 1998).
- “A SiC Release Layer / SiC / Si Platform For the Formation of Thermally Isolated MEMS Devices”, with H. Busta, F. Amantea, F. Pantuso, L. Goodman, L. White, D. Furst, M. Della Selva, V. Patel, G. Looney, and R. Farmer, *American Vacuum Society*, San Jose, CA (October 1997).
- “Numerical Study of Planar/Axisymmetric Yield/Power-law Jets”, with G. Vradis, *American Society of Mechanical Engineers*, AMD 217, 27-36, (1996).
- “Evolution of Jets of Herschel-Bulkley Fluids”, *ASME Grad. Student Conf.*, (1995).
- “Towards a successful continuous Czochralski growth process for Silicon crystals”, with V. Prasad, H. Zhang, A. Anselmo, and K. Gupta; *NSF Grantees Conference* (1994).
- “Study of the effect of obstruction in Czochralski crystal growth process”, with V. Prasad; *ASME Graduate Student Conference; NY* (1994).

HONORS, AWARDS AND MEMBERSHIPS

- Best Presentation Award ACCGE-east 1995 conference (Atlantic City NJ)
- Samuel Shapiro Scholarship Award (May 15, 1993)
- Scholarship from Organization for Development of Humanity (1993)
- Member - Nu Ypsilon Tau (Honor Society)
- Member - American Society of Mechanical Engineers (ASME)