

Zixiao Pan, Ph.D., P.E.
Senior Engineer

Professional Profile

Dr. Zixiao Pan is a Senior Engineer in Exponent's Materials and Corrosion Engineering practice. Dr. Pan specializes in failure analysis, materials science (metallurgy, ceramics, glass, polymer, and semiconductors), fractography, material degradation, and materials testing and evaluation. In particular, she has investigated failures and provided product development support in a variety of industries including portable electronics (e.g., MP3 players, smart phones, LCD displays), consumer products (contamination, corrosion, mechanical failure, materials evaluation, etc.), medical implants, industrial thin films, coatings and paint. Dr. Pan has extensive hands-on experience in advanced materials characterization and micro-fabrication techniques, such as scanning and transmission electron microscopy (SEM and TEM, including environmental SEM), atomic force microscopy, lithography and focused ion beam. She also has specific interests in synthesis, microstructure analysis, and mechanical property measurement of ceramics and ceramic composites as well as mechanical failures of glass and silicon.

Prior to joining Exponent, Dr. Pan attended Northwestern University, where she completed her Ph.D. in Materials Science and Engineering. Dr. Pan's research focused on nanofabrication and microstructural engineering of piezoelectric and magnetic oxides for memory device applications. Dr. Pan also worked for Northwestern University Atomic and Nanoscale Characterization Experimental Center (NUANCE) as a center associate for 3 years, where she managed laboratory equipment and provided user support and training on various electron microscopes and atomic force microscopes.

Academic Credentials and Professional Honors

Ph.D., Materials Science and Engineering, Northwestern University, 2008
M.S., Materials Science and Engineering, Tsinghua University, Beijing, 2003
B.S., Materials Science and Engineering, Tsinghua University, Beijing, 2001

- Recognition of Contribution Award, the Nanoscale Science & Engineering Center (NSEC) for Integrated Nanopatterning and Detection Technologies, 2008
- Research Highlights by the Materials Research Science and Engineering Centers, 2007
- Graduate Student Silver Award for excellence in graduate research, Materials Research Society, 2006
- Everly Fellowship, Northwestern University, 2006
- Roland B. Snow Award, the American Ceramic Society annual conference, 2005 and 2006
- NSF-Materials Research Science & Engineering Center (MRSEC) Fellowship, 2005-2006
- Guanghua Award, Tsinghua University, China, 2002
- Ronghong Foundation Fellowship, Tsinghua University, China, 2000

Licenses and Certifications

Registered Professional Metallurgical Engineer, California, #MT1962

Patents

U.S. Patent: Method of making nanopatterns and nanostructures and nanopatterned functional oxide materials, filed 20080070010 (Inventors: Dravid, Vinayak P.; Donthu, Suresh K.; Pan, Zixiao).

Publications

Book

Pan Z. Nanofabrication of Functional Ceramics. VDM Verlag Publishing, ISBN 9783639160338.

Journal Articles

Pan Z, Wei W, Li F. LA ICP-MS in microelectronics failure analysis. Journal of Materials Science: Materials in Electronic (Special Issue), Invited Contribution, in press, 2011.

Sun T, Pan Z, S. Xie, Z. Cai, Wang J, Dravid V. Probing subtle strain distribution around individual epitaxial oxide nanoline using scanning x-ray microdiffraction. Applied Physics Letters, in press, 2011.

Pan Z, Joseph R. Case study analysis of coating failure on steel hinge boxes. Metal Finishing 2009; 12.

Pan Z, Dugnani R, Wu M. Comparative study of stress profile measurements on thin, ion-exchanged aluminosilicate glass. Proceedings, Material Science & Technology 2009.

Sun T, Hu H, Pan Z, Li X, Wang J, Dravid V. In situ real-time investigation of kinetics of nucleation and growth of Sol-Gel-derived functional oxide thin films. Physical Review B 2008; 77:205414. (Featured in NSF-MRSEC Research Highlight at <http://www.mrsec.northwestern.edu/content/highlights/solgel.htm>)

Donthu S, Alem N, Pan Z, Li S-Y, Shekhawat G, Dravid V, Benkstein K, Semancik S. Directed fabrication of ceramic nanostructures on fragile substrates using soft-electron beam lithography. IEEE Transactions on Nanotechnology 2008; 7:917793.

Pan Z, Li S, Wang Z, Yu M-F, Dravid V. Patterning-controlled morphology of 0d and 1d functional oxide nanostructures. *Applied Physics Letters* 2007; 91:143105. (Selected for the October, 2007 issue of *Virtual Journal of Nanoscale Science & Technology*; this work was featured in NSF-MRSEC Research Highlight at <http://www.mrsec.northwestern.edu/content/highlights/strain.htm>)

Pan Z, Alem N, Sun T, Dravid V. Site-specific fabrication and epitaxial conversion of functional oxide nanodisc arrays. *Nano Letters* 2006; 6:2344.

Sun T, Pan Z, Dravid V, Wang Z, Yu M-F. Nanopatterning of multiferroic BiFeO₃ using “soft” electron beam lithography (Soft-eBL). *Applied Physics Letters* 2006; 89:163117.

Pan Z, Donthu S, Wu N, Li S, Dravid V. Directed fabrication of radially stacked multifunctional oxide heterostructures using soft electron beam lithography (Soft-eBL). *Small* 2006; 2:274.

Donthu S, Pan Z, Myers B, Shekhawat G, Wu N, Dravid V. Facile scheme for fabricating solid-state nanostructures using e-beam lithography and solution precursors. *Nano Letters* 2005; 5:1710.

Donthu S, Pan Z, Shekhawat G, Dravid V, Balakrishnan B, Tripathy S. Near-field scanning optical microscopy of ZnO Nanopatterns fabricated by micromolding in capillaries. *Journal of Applied Physics* 2005; 98(2):024304.

Su M, Pan Z, Dravid V, Thundat T. Locally-enhanced relative humidity for scanning probe nanolithography. *Langmuir* 2005; 21:10902.

Su M, Pan Z, Dravid V. A convenient and rapid sample repositioning approach for atomic force microscopy. *Journal of Microscopy* 2004; 216:194.

Li J, Pan W, Chen J, Fang M, Pan Z. Ti Metallization of AlN Surface by molten salt reaction. *Journal of Inorganic Materials* 2003; 18(5):1086–1090.

Fang Z, Pan W, Fang M, Shi S, Pan Z, Wang R. ZnS fabricated by spark plasma sintering and its properties. *Rare Metal Materials and Engineering* 2003; 32:590–593.

Pan Z, Pan W, Li R. Preparation of SiC ceramics by spark plasma sintering. *Key Engineering Materials* 2002; 224–226:713–716.

Pan Z, Pan W, Li R, Li J. Preparation of SiC ceramics by spark plasma sintering. *Rare Metal Materials and Engineering* 2002; 31:162–165.

Li R, Pan W, Pan Z. Microstructure and mechanical properties of Al₂O₃/SiC nanocomposites prepared by SPS. *Key Engineering Materials* 2002; 224–226:337–340.

Li J, Pan W, Pan Z, Li R. Ti metallization on SiC ceramics surface by molten salt reaction. *Rare Metal Materials and Engineering* 2002; 31:557–559.

Li R, Pan W, Li J, Pan Z, Wang R. Study on microstructure of Al₂O₃/SiC nanocomposites. *Rare Metal Materials and Engineering* 2002; 31:418–421.

Conference Presentations

Pan Z, Wei W, Li F. Fast turn-around failure analysis of metal inter connection using FIB and LA ICP-MS. 36th International Symposium for Testing and Failure Analysis, 2010.

Pan Z, Sun T, Donthu S, Dravid V. Structural engineering and characterization of dimensionally constrained multifunctional oxide nanopatterns. *Material Science & Technology Meeting*, 2009.

Pan Z, Dugnani R, Wu M. Comparative study of stress profile measurements on thin, ion-exchanged aluminosilicate glass. *Material Science & Technology Meeting*, 2009.

Myers B, Pan Z, Donthu S, Dravid V. Variable-pressure soft-electron beam lithography (VP Soft-eBL). *The Microscopy and Microanalysis Meeting*, 2007.

Donthu S, Pan Z, Dravid V. Tailoring the internal microstructure of functional inorganic nanopatterns. *Materials Research Society Spring Meeting*, 2007.

Pan Z, Donthu S, M. Aslam, Dravid V. Patterning of hierarchical multiferroic oxide nanostructures using soft electron beam lithography (Soft-eBL). *Materials Research Society Spring Meeting*, 2006.

Pan Z, Dravid V. Nanoscale patterning and characterization of multifunctional oxides. *Materials Research Society Fall Meeting*, 2006.

Pan Z, Alem N, Sun T, Dravid V. Patterning and identity of functional oxide nanostructures. *The Microscopy & Microanalysis Meeting*, 2006.

Donthu S, Pan Z, Srivastava AK, Chang Y, Dravid V. Site-specific fabrication of functional inorganic nanostructures. 3rd International Conference on Materials for Advanced Technologies, Singapore, 2005.

Peer Reviewer

Thin Solid Films
Journal of Materials Science: Materials in Electronics
Micro & Nano Letters

Prior Experience

Center Associate, NU Atomic and Nanoscale Characterization Experimental Center, 2005–2008
Intern, Founder High-Tech Ceramics Co. Ltd. of China (now Tsinghua Unisplendor Founder
High-Tech Ceramics Co. Ltd.), 2000

Professional Affiliations

- Materials Research Society
- American Ceramic Society
- ASM International
- Microscopy Society of America