

Nomination for 2016 AVS Excellence in Leadership Award

Nominee: Susan Trolier-McKinstry, The Pennsylvania State University, stmckinstry@psu.edu, <http://www.matse.psu.edu/directory/faculty/susan-trolier-mckinstry>; <https://vimeo.com/storyshop/review/74469922/b8d165908c>



Scientific/engineering accomplishments: Thin film deposition of materials, such as piezoelectric ferroelectric materials, are extremely difficult to synthesize, owing to volatility of a number of the key constituents in their formulations. Dr. Trolier-McKinstry has successfully produced the highest quality lead-based piezoelectric thin films, with a variety of techniques that control this lead activity and the quality of the crystallinity and stoichiometry, including pulsed laser deposition, chemical solution deposition and rf magnetron sputtering. She is known as one of the top researchers in the world in the area of piezoelectric MEMS. She has produced extremely novel devices for high frequency ultrasound, accelerometers, sensors, and energy harvesters. In fact, in the area of energy harvesting for piezoelectric MEMS devices, she has just hit a world record, beating the previous record by 50 times out of a very capable group in Europe. It should be emphasized that Dr. Trolier-McKinstry's contribution is not limited to device fabrication, but rather encompasses material design with respect to process, crystallographic orientation and texture, composition, microstructure, and defect chemistry in the deposition process. Including all of these components is necessary to maximize performance for specific applications. She is producing prototypes and also piezo thin films on 8-inch wafers with properties that exceed the best MEMS foundries in the U.S., Japan, Korea, and Europe. Nobody can produce 8-inch wafers with the critical material properties, such as breakdown strength, $e_{31,f}$ (piezo coefficient), and dielectric loss.

Outstanding mentoring/guidance: With NSF programs, she frequently reaches out to the K-12 members of the community. She is an active member of Women in Science & Engineering (WISE) and is an absolute example and mentor to all of her research group and within her graduate students, which number ~45 (approximately 25% of whom are women), and a similar number of postdoctoral scholars, plus 2-3 undergraduate researchers in her laboratory every year. This is a high percentage; her current group is ~50% female. From the Ph.D. students and postdocs that she has mentored, over 20 have gone into faculty positions around the world. This she has accomplished by incredible levels of intelligence, dedication, and leading by example.

Short biography: Susan Trolier-McKinstry is the Steward S. Flaschen Professor of Materials Science and Engineering and Electrical Engineering at The Pennsylvania State University, where she also serves as the director of the W. M. Keck Smart Materials Integration Laboratory and co-director of the Nanofab. She obtained B.S., M.S. and Ph.D. degrees in Ceramic Science and Engineering, all from Penn State. On graduation she joined the faculty there. She is a fellow of IEEE and the American Ceramic Society, and is an academician of the World Academy of Ceramics. Her main research interests include thin films for dielectric and piezoelectric applications. Her group studies the fundamental mechanisms that contribute to the measured properties, processing studies for electroceramic films, and integration of functional materials into microelectromechanical systems. Twenty former members of her group are now faculty members around the world; others have taken jobs with companies and national laboratories. Susan has over 380 publications, over 8,000 citations, with an h-index of 47.