Guest Editorial
Special Issue on Symposium on Fusion Engineering

THIS Special Issue is the first one published in the IEEE TRANSACTIONS ON PLASMA SCIENCE, covering the 23rd Symposium on Fusion Engineering (SOFE 2009) held on May 31–June 5, 2009, and chaired by Mark Tillack. The symposium covered engineering and scientific advances in both inertial and magnetic confinement fusion, with attendees from major fusion energy research centers worldwide. It is one of the most important conferences in this field. Fusion engineering continues to be an important area, given the continued engineering and technology advances in magnetic and inertial thermonuclear fusion. The objective of this Special Issue is to bring the most up-to-date developments reported at SOFE 2009 to the readership of the IEEE TRANSACTIONS ON PLASMA SCIENCE. SOFE 2009 highlights works in the area of fusion engineering, including ITER and experimental fusion devices, which include alternate fusion confinement devices; new device design and reactor studies; divertors and plasma–material interactions; chambers; vacuum vessels related to fusion device technology; plasma diagnostics; data acquisition and plasma control systems; safety and environmental engineering; plasma fueling; pumping and tritium handling systems; inertial fusion energy drivers; targets and related technologies; fusion device power systems; magnet engineering; electromagnetics; and electromechanics.

This Special Issue highlights a wide diversity of topics in fusion engineering. For example, a recent work on laser-based techniques to monitor tritium and dust inventory, control, and removal during tokamak operation was presented by Hernandez *et al.* This work places emphasis on its application to ITER. Klepper *et al.* presented a work on a fast exhaust-gas analyzer for the ITER divertor designed to measure quantitatively minority species in the ITER divertor neutralization region. Ibano *et al.* presented a work on lithiated graphite sputtering and evaporation, which is of critical importance to the National Spherical Torus Experiment plasma-material interface research at the Princeton Plasma Physics Laboratory. Meszaros *et al.* presented a preliminary investigation on the optical path components in the ITER core light identification and ranging diagnostic system. Testa *et al.* presented a general summary of the magnetic diagnostic set for ITER. Real-time reconstruction of the Frascati Tokamak Upgrade magnetic flux was presented by Sadeghi *et al.* Nieto *et al.* presented a computational modeling work of Be–C mixing in the ITER divertor vertical plate. Baylor *et al.* presented a work on disruption mitigation concepts of relevance to ITER, an increasing area of interest given the serious damage consequences of disruption events on plasma-facing components in ITER and future fusion plasma burning devices. These were some of the papers presented on fusion science and engineering. We are thrilled by the diversity and the high quality of the papers submitted to and published in this Special Issue. We would like to thank Dr. S. J. Gitomer for working closely with us in support of this Special Issue and S. P. Gillespie for the administrative support.

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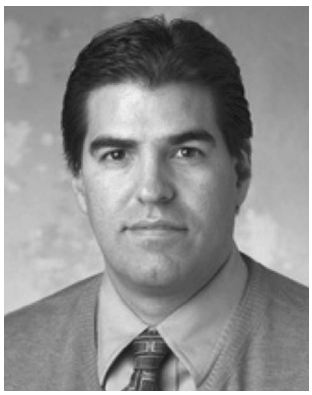
He is the Director of the Center for Plasma Material Interactions, University of Illinois at Urbana–Champaign, Urbana. He is a Professor with the Department of Nuclear, Plasma and Radiological Engineering, University of Illinois at Urbana–Champaign, and also with the Department of Electrical and Computer Engineering and the Department of Physics, where he joined the faculty in 1984. His current research interests center on plasma processing for the microelectronics industry (deposition, etching, extreme ultraviolet lithography, and particle removal) and on fusion energy research. He is the author of the American Vacuum Society (AVS) monograph, *Electric Probes for Low Temperature Plasmas*; numerous book chapters; patents; and over 120 refereed journal articles. He really enjoys teaching and tries to blow something up during every lecture.

Prof. Ruzic is a Fellow of the American Nuclear Society and of the AVS.



Jean Paul Allain received the B.S. degree in mechanical engineering with a minor in physics from the California State Polytechnic University, Pomona, and the M.S. degree in nuclear engineering and the Ph.D. degree from the Department of Nuclear, Plasma and Radiological Engineering, University of Illinois at Urbana–Champaign, Urbana.

He joined the Argonne National Laboratory as a Staff Scientist in 2003 and joined the faculty in the School of Nuclear Engineering, Purdue University, West Lafayette, IN, in the fall of 2007. He has a courtesy appointment with the School of Materials Engineering and is an affiliate faculty member of the Birck Nanotechnology Center. He is the author of over 50 papers in both experimental and computational modeling works in the area of particle–surface interactions in nuclear fusion materials science. His studies include developing *in situ* surface structure and composition evolution characterization of heterogeneous surfaces under low-energy irradiation, promoting structure and function at the nanoscale. He is also developing ion-beam-directed irradiation synthesis techniques with applications in semiconductor, biomaterials, and nuclear fusion materials science.

Prof. Allain is a member of the Materials Research Society, American Physical Society Division of Plasma Physics, and the Sigma Xi Honor Society. He served as a panel member of the Office of Fusion Science, Department of Energy (DOE), research needs workshop on plasma–wall interactions in 2009 and is currently a panel member of the DOE's Spherical Torus Coordinating Committee. He was a recipient of numerous awards, including the 2010 DOE Early Career Award, nominated candidacy to the 2010 ENI Award and the Paul Zmola Young Scholar Award.