

# Preface

## Special Issue on Measuring and Modeling of Plasma-Material Interactions

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The 57th Annual Meeting of the American Physical Society (APS) Division of Plasma Physics (DPP) took place November 16–20, 2015, in Savannah, Georgia, at the Savannah International Trade Convention Center. Contained within that meeting were three mini-conferences: Plasma Energization, Nonlinear Effects in Geospace Plasmas, and Measuring and Modeling of Plasma-Material Interactions. The last of these—Measuring and Modeling of Plasma-Material Interactions—was initiated by contributors to the U.S. Department of Energy project, Plasma-Surface Interactions: Bridging from the Surface to the Micron Frontier Through Leadership-Class Computing (PSI), a multi-institution project under the Scientific Discovery through Advanced Computing (SciDAC) program intended to generate higher fidelity models and associated software for the simulation of plasma-facing tungsten.

The past several decades of fusion energy research and development have led to promising advances in plasma physics and magnetically confined fusion, but the materials science of plasma-facing materials used in the construction of magnetically confined fusion reactors will remain a focus of significant research effort in the years ahead as we struggle to find plasma conditions that will not only initiate fusion reactions, but that allow for reasonable operating costs and reactor lifetimes. As our understanding of the physics of both plasmas and materials increases, the importance of computational tools and modeling efforts increases in tandem. This mini-conference, like the first such mini-conference two years ago, was intended to bring various aspects of the modeling efforts being undertaken nationally and internationally together into a single

forum, with the primary intent of presenting computational and/or materials research to the broader plasma physics community.

The plasma-material interactions mini-conference took place on Tuesday and Wednesday, November 17 and 18, 2015, and was attended both by scientists specializing in simulation and by those specializing in experimental plasma physics and materials science. The mini-conference was divided into three sessions of 8 or 9 oral presentations each, for a total of 26 presentations. These sessions included talks solicited from Robert Kolasinski (Sandia National Laboratories/Livermore), Masashi Shimada (Idaho National Laboratory), Giridhar Nandipati (Pacific Northwest National Laboratory), Sophie Blondel (Oak Ridge National Laboratory/University of Tennessee, Knoxville), Blas Uberuaga (Los Alamos National Laboratory), Sergei Krasheninnikov (University of California, San Diego), Dimitrios Maroudas (University of Massachusetts Amherst), Xianzhu Tang (Los Alamos National Laboratory), John Canik (Oak Ridge National Laboratory), and Peter Stangeby (University of Toronto).

This special issue of *Fusion Science and Technology* contains seven papers and two technical notes contributed by speakers at the mini-conference, as well as three papers contributed by the mini-conference organizers and others affiliated with the PSI-SciDAC project. Topics include molecular dynamics simulations of helium and hydrogen behavior in plasma-facing tungsten, coarse-grained modeling of helium transport in plasma-facing materials, helium and hydrogen behavior near defects such as dislocations and vacancy clusters, plasma recycling, neutron damage in tungsten, and the coupling of

plasma models to plasma-facing materials and/or surface erosion models.

The success of the mini-conference and this special issue would not have been possible without the efforts of many people. The organizers express their deep appreciation to the authors, both of presentations and of articles, as well as the anonymous referees who were involved with the peer review process. Our very special

thanks are extended to Nermin Uckan, editor of *Fusion Science and Technology*, who has undertaken great efforts to secure reviewers/arbitrators and to handle production and publication of the special issue. We also extend our thanks to the production and support staff of *Fusion Science and Technology* and the staff at the APS DPP.

We hope to see you at a future APS DPP meeting.