PREFACE

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From September 4 to 7, 2012, a Technical Meeting on Data Evaluation for Atomic, Molecular and Plasma-Material Interaction Processes in Fusion, jointly organized by the International Atomic Energy Agency (IAEA) and the National Fusion Research Institute (NFRI) (Republic of Korea), was held at the Daejeon Convention Center in Daejeon, Republic of Korea, in conjunction with the Eighth International Symposium on Standard Reference Data organized by the Korean Research Institute of Standards and Sciences (KRISS). This was the third in a series of meetings organized by the IAEA Atomic and Molecular (A&M) Data Unit in 2012 to review the current status of critical evaluation of atomic, molecular, and plasma-surface interaction (AM/PSI) data required for fusion and other plasma applications and to discuss ways to enhance and promote data evaluation activities in the AM/PSI communities.

Fusion studies require extensive sets of AM/PSI data for atoms, molecules, and solids coexisting in a wide range of conditions: Temperatures range from room temperature to millions of degrees, and densities range from less than one-millionth of atmospheric density to a few times solid density. For many applications the data need to be resolved (for example, with respect to excited states of atoms or molecules) to a degree that cannot be obtained from laboratory experiments. Naturally, computational data research projects relevant to fusion applications have grown in importance to generate unavailable data sets and have been largely successful due to the great advances in computational physics. At present, a variety of codes are freely available for users to run themselves to immediately obtain AM/PSI data for certain types of species and processes. However, data sets that are generated in this manner in general are not verified by experts, are lacking uncertainty assessments, and may even be inappropriate for the immediate or future application of the generated data. The importance of data verification has become more eminent as ITER and proposed DEMO reactors rely heavily on computationally intensive numerical simulations for their designs and as the quality of input data can affect the outcome of global plasma simulations. Colleagues in the data user community have emphasized the need for internationally evaluated and recommended standard data sets for AM/PSI processes that are critical to fusion applications.

Answering to the needs of data verification, the A&M Data Unit has collaborated with the data centers of the IAEA Data Center Network to review the current status of data evaluation and verification activities in the AM/PSI data-producing community. It was initially assumed to be extremely difficult to perform adequate data evaluation and verification due to insufficient funding and resources, retirement of experts, and lack of interest from younger scientists in addition to the technical difficulties of estimating data uncertainties. As more experts participated in discussions to find solutions for this problem, it became obvious that many scientists agreed on the need for critical assessment of AM/PSI data and were willing to collaborate on the subject matter. Intensive discussions and constant idea exchanges led to a set of recommendations and action plans for the IAEA A&M Data Unit, data centers, and experts in the community.

The meeting in Daejeon provided such an important venue for experts to discuss the need for and proper ways of performing data evaluations by which the field of AM/PSI data can be enhanced. This issue of *Fusion Science and Technology* contains the contributions by the invited speakers of this meeting on the following subjects: current status of evaluated databases, data evaluation methods, error propagation and sensitivity analysis, theoretical data evaluation and uncertainty estimates, experimental data evaluation and semiempirical fits, and evaluation activities of data centers. While it may contain results already available elsewhere as a part of reviews of the field, this issue is intended to present an overview of data evaluation activities in the community and to provide direction toward an internationally agreed standard data library of AM/PSI data for fusion applications.

This meeting would not have succeeded without the help of many people. The IAEA A&M Data Unit would like to first thank the chair of the local organizing committee, Dr. J. S. Yoon, for his leadership and dedication to the meeting and the data evaluation project. Our thanks go to the local organizing committee members Dr. C. G. Kim of KRISS and Dr. M. Y. Song of NFRI for their professional support, and also to NFRI General Director Dr. M. Kwon and Plasma Technology Research Center Director Dr. S. J. Yoo for the generous financial support from NFRI. The help of the scientific advisory committee chaired by Dr. I. Murakami with members Prof. Y. Itikawa, Prof. S. J. Buckman, Dr. R. K. Janev, Dr. V. P. Shevelko, Prof. Y. D. Jung, and Prof. H. Cho to invite speakers and review abstracts was crucial for the success of the meeting and is greatly appreciated. Finally, we would like to give special thanks to all the invited speakers for the excellent presentations and for the invaluable technical discussions and recommendations that are presented in this issue.