Recent coordinated activities on plasma-surface interactions at IAEA

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The Atomic and Molecular Data (AMD) Unit of the International Atomic Energy Agency (IAEA) [1,2] evaluates, recommends and makes available atomic, molecular, and plasma-surface interaction (AM/PSI) data for nuclear fusion research. It also facilitates international cooperation activities in the creation and validation of fundamental AM/PSI data for fusion applications. The Unit’s core activities are based on Coordinated Research Projects (CRPs) [3], maintaining and generating databases [4], and organizing various technical meetings [5] and workshops [6].

The CRPs bring together fusion scientists representing institutes in the Member States of the IAEA to collaborate on a focused research topic of relevance to fusion [3]. Two PSI-related CRPs are currently in progress: one CRP on “Plasma-wall Interaction with Reduced-activation Steel Surfaces in Fusion Devices”, and another on “Atomic Data for Vapour Shielding in Fusion Devices”. The Steel Surfaces CRP includes a round-robin exercise to perform coordinated experiments on sputtering yield on steels in different experimental devices [7]. The Vapour Shielding CRP focuses on the PSI effects leading to vapour formation, the shielding properties of the vapour, and the corresponding atomic and molecular processes between the vapour and fusion plasma particles. A new CRP is scheduled to be launched in 2020 on “Hydrogen Permeation in Fusion-relevant Materials”, which will study parameters affecting plasma fuel permeation in fusion reactor in-vessel components. Details and a progress report on these CRPs will be given in this presentation.

The Unit maintains fusion databases [4], which are searchable and freely available, including the ALADDIN database for numerical AM/PSI data, AMBDAS for bibliographical data, and Clerval database for institutions and events. A recent database activity, CascadesDB, was launched in 2017 and provides fusion neutron irradiation-induced damage cascade simulations in plasma-facing and structural materials [8]. The database includes simulations based on Molecular Dynamics (MD) calculations with various knock-on energies, temperatures and target materials. Currently the CascadesDB contains over 100 GB of data from over 1500 simulations with MD, and the call is open for content providers inputs.

[1] https://www.iaea.org
[8] https://cascadesdb.iaea.org