Contribution ID: **88** Type: **invited**

In-situ enhanced erosion of re-deposits: conclusions from modelling of tracer injection experiments

Thursday, July 18, 2024 9:50 AM (25 minutes)

The erosion of redeposited layers is typically larger than the erosion of the corresponding bulk material. However, the modelling of impurity tracer injection experiments in various fusion devices indicates an additionally enhanced re-erosion of particles during the process of layer formation. This can be interpreted as an "in-situ erosion"of transient layers involving particles, which are not yet fully bonded to the surface.
A large number of impurity tracer experiments has been carried out at various devices including for instance TEXTOR, ASDEX-Upgrade, JET and most recently also W7-X. As impurity source originally silane (SiH_4) and ^{13}C containing molecules such as methane ($^{13}CH_4$) or ethene ($^{13}C_2H_4$) have been used, later on also WF_6 and MoF_6 to minimise the influence of chemical erosion. In all experiments a well known amount of these impurities is injected into the edge plasma under well defined and constant conditions. After retrieval of the samples, extensive post-mortem analysis covering NRA, SIMS or colorimetry provided detailed information of the (local) deposition of the impurities in the vicinity of the injection location. The experiments have been modelled with the 3D impurity transport and plasma-wall interaction code ERO. To reproduce the locally deposited amount of injected impurities, in all simulations an enhanced erosion (compared to bulk material) had to be assumed. The magnitude of the enhancement factor depends on various parameters such as impact energy and flux of depositing particles.
The present contribution summarises the main outcome of the available injection experiments and according modelling. Conclusions concerning possible adaptions of erosion yields under certain conditions will be drawn. Finally, a brief discussion about possible studies of enhanced erosion in lab experiments and MD-based modelling will be provided.

Primary author: KIRSCHNER, Andreas (Forschungszentrum Juelich GmbH)

Co-authors: BREZINSEK, Sebastijan (Forschungszentrum Jülich); ROMAZANOV, Juri (Forschungszentrum Jülich GmbH); KRETER, Arkadi (Forschungszentrum Juelich); DITTMAR, Timo (Forschungszentrum Jülich GmbH); Prof. LINSMEIER, Christian (Forschungszentrum Jülich)

Presenter: KIRSCHNER, Andreas (Forschungszentrum Juelich GmbH)

Session Classification: PSI and PMI modelling