Abstract Submitted
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Detailed Kinetic Modeling of Processes Relevant To Fusion Energy[1] MARCO MEHL, MICHAEL ARMSTRONG, JOSEPH ZAUG, JONATHAN CROWHURST, HARRY RADOUSKY, ELISSAIOS STAVROU, Lawrence Livermore Natl Lab — Carbon based materials have been proposed as candidates for the fabrication of plasma–facing components in the design of fusion energy devices. Although these components are not supposed to be in direct contact with the core fusion plasma, plasma instabilities and the harsh environment they are exposed to can cause the degradation of plasma-exposed components and the transfer of contaminants into the plasma followed by deposition of byproducts. In order to investigate the chemistry involved in these processes and to assist the development of models suitable to understand the long term consequences of the carbon ablation/deposition cycle, an inductively coupled plasma flow reactor (ICPFR) has been developed. The ICPFR allows the atomization of carbon containing precursors to high temperatures (in the order of 10000K) and the characterization of the gas and solid species formed downsteam from the plasma source through spectroscopic techniques. In parallel to the experimental analysis a comprehensive set of fluid dynamic and detailed kinetic simulations are used to analyze the data. The combination of these two approaches resulted in a validated and comprehensive chemical model for the formation of carbon deposits in carbon contaminated cooling plasmas.

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