Abstract Submitted
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A model of early formation of uranium molecular oxides in laser-ablated plasmas[1] MIKHAIL FINKO, DAVIDE CURRELI, Univ. of Illinois Urbana-Champaign, MAGDI AZER, Illinois Applied Research Institute, DAVID WEISZ, JONATHAN CROWHURST, TIMOTHY ROSE, BATIKAN KOROGLU, HARRY RADOUSKY, JOSEPH ZAUG, MIKE ARMSTRONG, Lawrence Livermore National Laboratory — An important problem within the field of nuclear forensics is fractionation: the formation of post-detonation nuclear debris whose composition does not reflect that of the source weapon. We are investigating uranium fractionation in rapidly cooling plasma using a combined experimental and modeling approach. In particular, we use laser ablation of uranium metal samples to produce a low-temperature plasma with physical conditions similar to a condensing nuclear fireball. Here we present a first plasma-chemistry model of uranium molecular species formation during the early stage of laser ablated plasma evolution in atmospheric oxygen. The system is simulated using a global kinetic model with rate coefficients calculated according to literature data and the application of reaction rate theory. The model allows for a detailed analysis of the evolution of key uranium molecular species and represents the first step in producing a uranium fireball model that is kinetically validated against spatially and temporally resolved spectroscopy measurements.

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