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Actinide Sputtering Induced by Fission with Ultra-cold Neutrons
MICHAEL VENUTI, Colorado Sch of Mines, TAN SHI, University of Michigan, DEION FELLERS, CHRISTOPHER MORRIS, MARK MAKELA, Los Alamos National Laboratory — Understanding the effects of actinide sputtering due to nuclear fission is important for a wide range of applications, including nuclear fuel storage, space science, and national defense. A new program at the Los Alamos Neutron Science Center uses ultracold neutrons (UCN) to induce fission in actinides such as uranium and plutonium. By controlling the energy of UCN, it is possible to induce fission at the sample surface within a well-defined depth. It is therefore an ideal tool for studying the effects of fission-induced sputtering as a function of interaction depth. Since the mechanism for fission-induced surface damage is not well understood, especially for samples with a surface oxide layer, this work has the potential to separate the various damage mechanisms proposed in previous works. During the irradiation with UCN, fission events are monitored by coincidence counting between prompt gamma rays using NaI detectors. Alpha spectroscopy of the ejected actinide material is performed in a custom-built ionization chamber to determine the amount of sputtered material. Actinide samples with various sample properties and surface conditions are irradiated and analyzed. In this presentation, we will discuss our experimental setup and present the preliminary results.

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