

The Plutonium-Hydrogen Interaction Studied via X-ray Photoemission

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Hydrogen has been shown to greatly increase the corrosion of plutonium resulting in adverse implications for safe storage and stability. Therefore, understanding the nucleation and growth of plutonium hydriding is critical in helping to understand this corrosion phenomenon. In this study, hydrogen gas dosing is performed on alloyed plutonium at different temperatures and probed with X-ray photoemission spectroscopy to better understand the early kinetics and thermodynamics of plutonium hydriding. Dosing is completed at a rate of 0.5 Langmuir (L) per second with total dosing ranging from 5-400 L. Depth profiles, probing the propagation of the nucleated hydride are completed at 200 L for each temperature studied. These results are discussed to provide context to the interplay of hydrogen solubility in the metal, hydride nucleation, and the hydride growth rate.