

Abstract Submitted  
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**Using magnetization measurements to detect small amounts of plutonium hydride formation in plutonium metal** C.H. MIELKE, Los Alamos Natl Lab, J.W. KIM, Rutgers Center for Emergent Materials, E-D. MUN, Simon Frazer University, J.P. BAIARDO, A.I. SMITH, S. RICHMOND, J. MITCHELL, D. SCHWARTZ, V.S. ZAPF, Los Alamos National Laboratory — We report the formation of plutonium hydride in 2 at % Ga-stabilized  $\delta$ -Pu, with 1 atomic % H charging. We show that magnetization measurements are a sensitive, quantitative measure of ferromagnetic plutonium hydride against the nonmagnetic background of plutonium. It was previously shown that at low hydrogen concentrations, hydrogen forms super-abundant vacancy complexes with plutonium, resulting in a bulk lattice contraction. Here we use magnetization, X-ray and neutron diffraction measurements to show that in addition to forming vacancy complexes, at least 30% of the H atoms bond with Pu to precipitate  $\text{PuH}_x$ , largely on the surface of the sample with  $x \sim 1.9$ . We observe magnetic hysteresis loops below 40 K with magnetic remanence, consistent with precipitates of ferromagnetic  $\text{PuH}_{1.9}$ .

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