## Abstract Submitted for the MAR17 Meeting of The American Physical Society

Elastic moduli of  $\delta$ -Pu<sup>239</sup> reveal changes in aging in real time<sup>1</sup> BORIS MAIOROV, JONATHAN BETTS, Los Alamos National Laboratory, PER SDERLIND, ALEXANDER LANDA, Lawrence Livermore National Laboratory, SARAH HERNANDEZ, TARIK SALEH, FRANZ FREIBERT, ALBERT MIGLIORI, Los Alamos National Laboratory — We study the time evolution (aging) of the elastic moduli of an eight-year-old polycrystalline  $\delta$ -Pu 2.0 at % Ga alloy  $(\delta$ -Pu:Ga) from 295K to nearly 500K in real time using Resonant Ultrasound Spectroscopy (RUS). After 8 years of aging at 295K, the bulk and shear moduli increase at a normalized rate of 0.2%/year and 0.6%/year respectively. As the temperature is raised, two time dependences are observed, an exponential one of about a week, followed by a linear one (constant rate). The linear rate is thermally activated with an activation energy of 0.33 + 0.06 eV. Above 420K a qualitative change in the time evolution is observed; the bulk modulus decreases with time while the shear modulus continues to stiffen. No change is observed as the  $\alpha - \beta$  transition temperature is crossed as would be expected if a decomposition of  $\delta$ -Pu:Ga to  $\alpha$ -Pu and Pu<sub>3</sub>Ga occurred over the temperature range studied. Our results indicate that the main mechanism of aging is creation of defects that are partially annealed starting at T =420 K.

<sup>1</sup>This work was supported as part of the Materials Science of Actinides, an Energy Frontier Research Center funded by the U.S. Department of Energy, Office of Science, Basic Energy Sciences under Award DE-SC0001089.

Boris Maiorov Los Alamos National Laboratory

Date submitted: 10 Nov 2016

Electronic form version 1.4