

Solubility of U in Ga-Stabilized δ -Pu Shown by Electron Probe Microanalysis

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The behavior of U in Ga-stabilized δ -Pu is important for understanding the ingrowth of U during Pu aging. Traditional characterization methods of prepared alloys of the Pu-U-Ga phase diagram, such as optical microscopy, SEM-EDS, and XRD, either cannot show chemistry or cannot provide quantitative chemistry to show elemental distribution. Electron probe microanalysis (EPMA) using wavelength-dispersive spectroscopy (WDS) can provide quantitative data on grains smaller than 10 μm , with detection limits often below 0.1 wt. %.

We present the results of EPMA analysis on low-U (≤ 1 at%) alloys in the Pu-U-Ga phase diagram using quantitative mapping over $256 \times 256 \mu\text{m}$ with a spot size of 1 μm . The data show U concentrations between 0.5 and 2 at. % in Pu grains, co-located Ga, indicating the material is Ga-stabilized δ -Pu. XRD analysis has verified the material as δ -Pu.

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