

Determination of Phase Equilibria in Uranium Silicide Fuel

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The uranium-silicide compound, U_3Si_2 , is one of the fuel forms currently being developed as an accident tolerant fuel for light water reactors. Understandably the U_3Si_2 fuel phase has been well characterized, however, because of its narrow compositional range it is particularly important to understand U-Si phase equilibria beyond the U_3Si_2 region. In this work we fabricated and characterized samples prepared in the 30-60 at.% U to elucidate phase relations. Samples were prepared by arc-melting the constituents and annealing the resulting ingots. Analysis included structural characterization (X-ray and neutron diffraction), and microstructural examination (SEM-EDS) to allow for phase identification and detection of possible homogeneity ranges. Differential scanning calorimetry was used to identify phase transitions. These experimental results complemented with *ab initio* calculations were used as input for thermodynamic assessments to obtain accurate U-Si thermochemical descriptions and computed phase equilibria.

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