

Fabrication and Phase Analysis of U_3Si_2 alloyed with Cr, Nb, and Zr.

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One recent advancement in the leading commercial carbon-free energy source, nuclear power, has been the development of accident tolerant fuels for deployment in existing light water reactors. Improvement over current uranium dioxide fuels requires a more economical, higher uranium density fuel with enhanced mechanical and thermal properties. Uranium silicide fuels have been shown to satisfy several critical ATF metrics, but susceptibility to oxidation and washout must be addressed.

It is proposed that alloying additions or dopants could improve the response of U_3Si_2 to oxygen or water containing atmospheres during off-normal conditions. Presented will be x-ray diffraction, scanning electron microscopy, and energy dispersive spectroscopy characterization of the as fabricated and post-annealed compositions of U_3Si_2 alloyed with up to 12 volume percent Al, Cr, Nb, and Zr. Additionally, this work will discuss and present on the sinterability of the ternary compositions and report on the oxidative damage due to steam exposure. Preliminary characterization will reveal microstructural change following anneal of the ternary compositions and a delay in the onset of oxidation in steam. Then, these changes can be compared to the sintered forms of the alloys.