Steam Oxidation Dynamics of Alloyed U_3Si_2+X (X=Al, Cr, Nb, Y, and Zr)

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Uranium silicides have proven of interest as advanced technology reactor fuels due to their enhanced thermal conductivity and high uranium density (U_3Si and U_3Si_2) compared to traditional UO_2. However, susceptibility to oxidation and wash out, in the event of a cladding breech, could limit the potential for deployment of silicides as accident tolerant fuels. Mitigating the water reaction for U_3Si_2 could enable its use as an accident tolerant, high uranium density fuel or as a composite fuel constituent. Presented will be the steam oxidation behavior of U_3Si_2 alloyed with Al, Cr, Y, Nb, and Zr ranging from 2-12 volume percent alongside screening data for unalloyed U_3Si_2 and UO_2. It has been identified that at alloying levels above 6vol%, the steam oxidation dynamics are altered, from non-alloyed U_3Si_2, under thermally ramped conditions. The modified reaction kinetics for the alloyed compositions will be presented and discussed. Additionally, the microstructural degradation of the alloyed compositions and x-ray power diffraction patterns of the oxidation products will be presented.