

### **On the oxidation mechanism of U<sub>3</sub>Si<sub>2</sub> accident tolerant nuclear fuel**

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Abstract:

The oxidation mechanism and products of U<sub>3</sub>Si<sub>2</sub> accident tolerant nuclear fuel in flowing air up to 750 °C is reported. Differences between observed and theoretical mass gains for complete oxidation is due to un-oxidised Si that forms nano-crystalline regions of Si. Some Si rich regions are protected by the formation of UO<sub>2</sub>, which is thermodynamically preferential to oxidise before Si. The UO<sub>2</sub> is further kinetically oxidised to form nano-crystalline U<sub>3</sub>O<sub>8</sub>. The nanostructure formed, accompanied by large volumetric expansions during oxidation produces pulverisation of fragments into powder, which may have serious consequences for fuel integrity if exposed to oxidative atmospheres.