

## **High-strength crystal-amorphous Ni-SiOC nanocomposites with superb plastic flow stability**

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**Abstract:** Strong, ductile, thermally stable, and irradiation tolerant materials are in urgent demand for improving the safety and efficiency of advanced nuclear reactors. Materials that employ microstructure features to manage radiation damage and maintain high-temperature mechanical properties are especially desirable. We design amorphous ceramic and metallic composites with two distinctive microstructures – amorphous ceramics composites (ACCs) containing nanoscale metal-rich heterogeneities in amorphous ceramics matrix and amorphous ceramic reinforced metals (ACMs) containing fine-scale, thermally-stable, amorphous ceramic particles in metal matrix - through tailoring the composition and microstructure of amorphous ceramics and metal phases. Both ACCs and ACMs exhibit improved mechanical properties, helium management and irradiation resistance in high temperature and irradiation environments. More importantly, we will develop the processes-microstructures-properties relations in order to accelerate the discovery and development of amorphous ceramic and metallic composites for applications under extreme conditions.