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Silicon oxycarbide: a novel perspective material for nuclear applications

Next-generation energy systems require novel materials with enhanced thermal stability, oxidation resistance, and radiation tolerance, specifically in case of nuclear applications. Silicon oxycarbide (SiOC) offers promise as a protective coating for metal components or TRISO-coated particles. SiOC, a two-phase material, consists of an amorphous silica-based matrix with carbon partially substituting oxygen ions and a dispersed graphite-like free carbon phase. This study focuses on developing and characterising SiOC-based coatings for nuclear reactor construction components. SiOC, derived from pyrolysis of silsesquioxanes, is deposited onto AISI 316L austenitic stainless steel. These coatings, with favourable mechanical properties and excellent adhesion, will enhance radiation tolerance and oxidation resistance. Anticipated results will bridge the gap between fundamental research and industrial implementation in nuclear reactors.

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