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Reprocessing of Carbide Fuels in Molten Chlorides

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Innovative reprocessing methods of spent nuclear fuel are now under development worldwide in order to deliver reprocessing technology compatible with future reactor technologies and novel GEN-IV fuels, including carbide fuels proposed for gas cooled fast reactor (GFR). The main aim of this study, as a part of the ASGARD project (Advanced fuels for Generation IV reactors: Reprocessing and Dissolution) has been to investigate the feasibility and to explore pyrochemical and electrochemical methods for reprocessing of carbide fuels in molten chloride systems.

The solubility, reactivity and the potential for thermal oxidation of silicone carbides (SiC, α -SiC, β -SiC) and TiC, which are considered as potential cladding materials for carbide fuels were investigated in three different high-temperature molten chloride systems: CaCl₂, CaCl₂ + CaCO₃ and CaCl₂ + NaCl as a function of temperature, time of pyrochemical treatment and the relative content of CaO. The main analytical methods for the characterisation of the quenched melts applied in the current stage of the study are X-Ray diffraction (XRD) and thermogravimetric analysis (TGA).

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