# Comparative Simulation of ATF Cladding Material in a PWR Reactor under Severe Accident Conditions Using the MELCOR and MAAP Codes

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**Abstract.** This study presents the simulation of a severe accident scenario in the APR1400 pressurized water reactor using the MELCOR and MAAP code, with a focus on evaluating the performance of silicon carbide composite cladding as an accident tolerant fuel concept. The scenario used for an assessment was an unmitigated large-break loss-of-coolant accident, with only passive safety systems available. SiC/SiC composite cladding was implemented via MELCOR's User Defined Material (UDM) feature based on temperature-dependent material properties, and oxidation was modelled using generalized oxidation modelling and custom oxidation kinetics. Comparative analysis with conventional zirconium alloy cladding revealed that SiC cladding significantly delayed core degradation, reduced oxidation heat, and decreased hydrogen generation. Despite MELCOR's tendency to overestimate thermal response compared to MAAP, both codes exhibit consistent trends in accident progression, supporting the potential of SiC/SiC composites for enhancing nuclear fuel safety in severe accident conditions.