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Basic Visualization Experiments on Eutectic Reaction of Boron Carbide and Stainless Steel under Sodium-Cooled Fast Reactor Conditions

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This paper describes basic visualization experiments on eutectic reaction and relocation of boron carbide (B4C) and stainless steel (SS) under a high temperature condition exceeding 1500°C as well as the importance of such behaviors in molten core during a core disruptive accident in a Generation-IV sodium-cooled fast reactor (750MWe class) designed in Japan. At first, a reactivity history was calculated using an exact perturbation calculation tool taking into account expected behaviors. This calculation indicated the importance of a relocation behavior of the B4C-SS eutectic because its behavior has a large uncertainty in the reactivity history. To clarify this behavior, basic experiments were carried out by visualizing the reaction of a B4C pellet contacted with molten SS in a high temperature-heating furnace. The experiments have shown the eutectic reaction visualization as well as freezing and relocation of the B4C-SS eutectic in upper part of the solidified test piece due to the density separation.

Country/Int. Organization

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