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Advances in the Development of the SAS4A Code Metallic Fuel Models for the Analysis of PGSFR Postulated Severe Accidents

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The SAS4A safety analysis code, originally developed for the analysis of postulated Severe Accidents in Oxide Fuel Sodium Fast Reactors (SFR), has been significantly extended to allow the mechanistic analysis of severe accidents in Metallic Fuel SFRs. The new SAS4A models track the evolution and relocation of multiple fuel and cladding components during the pre-transient irradiation and during the postulated accident, allowing a significantly more accurate description of the local fuel and cladding composition. The local fuel composition determines the fuel thermo-physical properties, such as freezing and melting temperatures, which in turn affect the fuel relocation behavior and ultimately the core reactivity and power history during the postulated accident. The models describing the fission gas behavior, fuel-cladding interaction, clad wastage formation and cladding failure models have been also significantly enhanced. The paper provides on overview of the SAS4A key metal fuel models emphasizing their new capabilities, and presents results of SAS4A whole core analyses for selected PGSFR postulated severe accidents.

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