

The Chernobyl corium: generation, interaction with concrete and progression

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Abstract

In the paper the results achieved during ISTC #2916 project implementation are summarized. Main objectives of the project were the systematization of a huge body of data on Lava-like Fuel-Containing Materials (LFCM) collected over 20 years of investigations at the “Shelter”, the development the knowledge on the processes of lava generation, its interaction with the concrete and spreading during early post-accident days.

Initial data involved in the data base included condition of the fuel, materials and constructions of the Unit 4 before the accident, materials incorporated into the “lava”, heat sources, and sequence of physical and chemical lava-generation processes adopted for further consideration. Set of parameters necessary for lava spread modeling were determined including lava viscosity, density, heat capacity, thermal conductivity, heat removal parameters etc.

The results of modeling are presented which include the results of interactions with concrete and also results of simulation of the spreading phenomenon. The probable LFCM temperature range was evaluated. Qualitative agreement between modeling results and observations was obtained. It was found that results are very sensitive to the dependence of viscosity upon temperature. Other uncertainties such as corium flow rate through the break also influence significantly modeling results.

The main outcome of simulation of lava interaction and spreading was reasonable and self-consistent agreement between observed and calculated lava characteristics.