**Summary**

**The Final report on the ISTC project #3592 “Investigation of Corium Melt Interaction with NPP Reactor Vessel Steel” (METCOR-P)**

Objectives of METCOR-P project: qualification and quantification of physicochemical phenomena of corium melt interaction with reactor vessel steel with a particular interest to:

- Interaction at a vertically positioned interaction interface;

- European vessel steel behavior at interaction;

- Oxidation effects.

MAIN RESULTS

1. Based on the results of experiments on the interaction between molten corium and VVER RPV steel in the oxidizing atmosphere,
   * A process model was developed and correlations to generalize experimental data on corrosion kinetics were proposed;
   * A possibility of corrosion acceleration due to liquid-phase diffusion of Fe2+ ions through the corium crust on steel surface was established and limitation of this phenomenon by the conditions of oxidizer admission to corium melt was demonstrated.
2. Based on the results of experiments on the interaction between the suboxidized molten corium and VVER RPV steel,
   * The effect of thermal gradient conditions on the composition of the oxide and metal phases of the U-Zr-Fe-O system in the miscibility gap was recognized;
   * A process model for the temperature boundary of corrosion was proposed;
   * A correlation generalizing experimental data on corrosion kinetics was obtained.
3. Based on the results of experiments on the interaction between molten corium and European RPV steel,
   * Qualitative agreement and quantitative closeness between the results for European and Russian reactor vessel steels was demonstrated;
   * Insufficiency of experimental data for constructing general correlations to describe corrosion kinetics was stated.
4. Based on the results of experiments on the interaction between molten corium and vessel steel samples with the vertically oriented interface,
   * It was found that the interface orientation had almost no effect on the interaction process which is of physicochemical nature;
   * A difference was revealed between the temperature boundary of corrosion for steel samples interacting with the metal melt in the neutral atmosphere and those interacting with the suboxidized corium melt
5. Based on the results of experiments on the oxidation of molten corium,
   * It was established that in the experimental conditions, oxidation of melt followed the diffusion mechanism with oxidizer starvation;
   * It was found that the oxidation rate was essentially reduced by a crust on the melt surface. Because of cracks in the crust, the oxidation rate observed in the experiments remained constant and did not depend on the crust thickness.