Proposal for opening the project
"Radiation tolerance of materials to high intensity heavy ion beams impact"
(Project leader – V.A. Skuratov)

The project focuses on systematically studying the structural effects caused by swift heavy ions in materials with potential nuclear and nanotechnology applications in order to shed light on the fundamental mechanisms and sub-picosecond kinetics of the resulting excitations. The project's aims are to accumulate a set of basic data for a better understanding of the fundamental physics behind intense ionization processes in materials and to test the radiation tolerance of target materials for nuclear physics experiments. Using an innovative approach based on the study of the effects of dense ionisation on pre-existing defect structures formed by conventional radiation could lead to original results that would be highly appreciated by the scientific community.

To achieve these objectives, an international project team plans to utilize modern structural analysis techniques, Monte Carlo and molecular dynamics simulations for determining threshold conditions and parameters of latent tracks in both nanostructured and bulk materials. This approach has already proven informative, as evidenced by recent publications elucidating track formation mechanisms in radiation-resistant dielectrics.

The project will address the impact of swift heavy ions on defect structures created by low-energy heavy ions, which accurately simulate radiation damage from nuclear fission products. The combined effect of high-density ionization and helium atoms on the transport properties of fission products in nuclear fuel materials will be explored. To verify existing and develop new atomistic mechanisms for the formation of latent tracks, particularly in radiation-resistant dielectrics, studies will be conducted on ion tracks in nanostructured materials with varying grain sizes across a broad range of electronic stopping powers. Investigations of the evolution of the microstructure of oxide and carbide nanoparticles in oxide dispersion strengthened alloys under irradiation by high-energy heavy ions and the recrystallization processes will be performed and provide original results on track formation, morphology, and reconstruction processes.

In conclusion, I fully support and recommend the opening of this project theme.

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