

INTERNATIONAL NUCLEAR ENERGY RESEARCH INITIATIVE

Advanced Dispersion Strengthened Ferritic Alloys and F/M Steels with Fine Nanoscale Dispersions

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Project Abstract

The primary objective of this proposal is the development of high-performance ferritic alloys strengthened by the dispersion of nano-size particles for advanced high-temperature nuclear technologies such as cladding for sodium fast reactors. The project focuses on the dispersion of Ti-, Y-, and O-rich nanoclusters in mechanically alloyed ferritic alloys containing 13%Cr to 18%Cr and nano-size nitrides (and possibly carbides) in 9%Cr tempered martensitic/ferritic alloys. The key to developing these alloys will be to obtain 1) fundamental knowledge of the processing and fabrication methods for achieving the nano-size particle dispersions in the microstructure, 2) the corresponding relationship between the microstructure and the deformation and fracture properties, and 3) ultimately the stability of the microstructure and mechanical properties during exposure to neutron irradiation.