Neutron irradiation and high temperature effects on amorphous Fe-based nano-coatings on steel substrates

Scientific Achievement
Remarkable corrosion resistance and impedance to ductility loss was exhibited by amorphous Fe-based coatings on steel under fast neutrons and corrosive environment. The amorphous structure of the Fe-based coating was maintained for much higher neutron doses.

Significance and Impact
Ductility enhancement combined with corrosion protection offered by the Fe-based coatings represent a significant advancement in nuclear steels under extreme environments.

Research Details
- Spallation-generated fast neutrons, combined with corrosive environment were used to irradiate special steel samples overlaid with Fe-based nano-structured coatings
- Post-irradiation evaluation revealed dimensional stability, ductility loss resistance and superior corrosion resistance
- X-ray diffraction studies at NSLS-II Beamline 28-ID revealed the evolution of phases and confirmed the amorphous structure with increasing neutron dose


Work was performed at Brookhaven National Laboratory