

Irradiation Effect of SIMP Steel as Candidate Structural Materials for Accelerator Driven System

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The technological challenge presented by the conceptual future ADANES is the inability of current materials and components to withstand the harsh nuclear environment. Continue long-running program was performed to pursue development of low activation structural materials, with the greatest effort directed at the SIMP steels. Recent progress on the irradiation response of candidate structural material SIMP steel will be introduced in this study.

Microstructure evolution of SIMP and T91 steels under energetic Fe ions irradiation at the elevated temperature to the dose of 260 dpa has been investigated by using a TEM with the cross-sectional specimen technique. The swelling due to the formation of the cavities increased significantly and reach a peak value at the irradiation temperature of 440°C. It was noted that an important feature of SIMP steels microstructure under irradiation at high temperature regime was the appearance of cavities swelling replaced by irradiation induced second-phase particles. It is revealed that the appearance of the precipitates may play an important role in inhibiting swelling in the martensite lath. The relationship between radiation induced precipitation and cavity swelling in SIMP steels has been discussed in this work.

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