ATOMIC LEVEL CHARACTERIZATION OF NEUTRON IRRADIATED PRESSURE VESSEL STEELS, M. K. Miller, Metals and Ceramics Division, Oak Ridge National Laboratory, Oak Ridge, TN 37831-6376, USA; P. Pareige, Groupe de Physique des Matériaux, UMR CNRS 6634, Faculté des Sciences et INSA de Rouen, 76821 Mont Saint Aignan Cedex, France

Atom probe tomography provides one of the most effective tools to characterize the solute distribution and precipitation that occurs in pressure vessel steels and associated model alloys during irradiation. The three-dimensional atom probe is able to experimentally determine the spatial coordinates and the elemental identities of the atoms with near atomic resolution so that their distribution within small volumes of the specimen can be reconstructed and analyzed. This technique together with conventional atom probe field ion microscopy have been applied to many different types of pressure vessel steels and model alloys and have revealed and characterized several different nanostructural transformations. These radiation induced or enhanced processes lead to the formation of copper-nickel-manganese-silicon precipitates, and solute segregation to dislocations, dislocation loops, nanovoids and boundaries. A review and a comparison of the radiation induced phase transformations and segregation in Western, Russian and French reactor pressure vessel steels will be presented.

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