**TENSILE PROPERTIES AND DAMAGE MICROSTRUCTURES IN ORR/HFIR-IRRADIATED AUSTENITIC STAINLESS STEELS** – E. Wakai and S. Jitsukawa, (Japan Atomic Energy Research Institute), N. Hashimoto (Oak Ridge National Laboratory), T. Sawai (JAERI), J. P. Robertson (ORNL), and A. Hishinuma (JAERI)

Extended Abstract (the full paper will be published in the Journal of Nuclear Materials as Proceedings of the Ninth International Conference on Fusion Reactor Materials, October 10-15, 1999, Colorado Springs, Colorado).

The synergistic effect of displacement damage and helium generation under neutron irradiation on tensile behavior and microstructures of austenitic stainless steels was investigated. The steels were irradiated at 400°C in the spectrally tailored (ST) ORR/HFIR capsule to 17 dpa with a helium production of about 200 appm and in the HFIR target capsule to 21 and 34 dpa with 1590 and 2500 appm He, respectively. The results may be summarized as follows:

(1) The increase of yield strength in the JPCA-SA irradiated at 400°C to 17 dpa in the spectrally tailored ORR/HFIR capsules was about 390 MPa, and that in the HFIR target one to 21 and 34 dpa were about 630 and 600 MPa, respectively.

(2) The spectrally tailored irradiation-induced Frank-type loops with a number density of $8 \times 10^{21}$ $m^{-3}$ and the mean size of 19.3 nm, bubbles and voids with $8 \times 10^{21}$ and $8 \times 10^{19}$ $m^{-3}$, respectively, and the mean sizes of 3 and 9.5 nm, respectively, and carbides with $8 \times 10^{21}$ $m^{-3}$ and 3.4 nm.

(3) The HFIR target irradiation also induced these defect clusters, and the number densities of these clusters were higher than the former case and these mean sizes were smaller than those.

(4) The values of hardening due to these clusters were calculated from the model of dispersed barrier hardening and were 331 and 666 MPa, respectively, and these coincide with the increase of yield strengths.

(5) This analyses wad furthermore suggested that the main factor of hardening in the spectrally tailored ORR/HFIR and the HFIR target irradiation were Frank-type loops and cavities, respectively. The similar results were obtained for the J316-SA steels.