1157, Bq-19

THE RESONANT MOTION OF IMPEDANCE AND FMR SPECRTA IN IRRADIATED LOW ALLOY STEEL

Seung Sik Park[1,2], K. O. Chang[1], W. S. Park[1], and C. O. Kim[2]

[1]TCNC, Korea Atomic Energy Research Institute,
Yuseong P.O. Box 105, Daejeon 305-600, Korea
[2]Departmrnt of Chungnam National University,
Daejeon 305-764, Korea

ABSTRACT

Radiation induced defects in metals are well known to change their physical properties and magnetic characteristics. High energy neutron radiation causes embrittlement of reactor pressure vessel (RPV) materials. Irradiation induced magnetic parameter changes were measured and compared with mechanical properties for possible correlations in Mn-Mo-Ni low alloy steel surveillance specimens. Their dose levels were in the range of 1.228×10^{19} to 3.9×10^{19} n/cm^2. The FMR (ferromagnetic resonance), and complex permeability were applied for the magnetic methods. FMR intensity decreased and the resonance line width increased as the neutron dose was increased. FMR linewidth (ΔH) increased up to 20% and the resonance field increased as well in the neutron dose of $3.9 \times \times 10^{19}$ n/cm^2. The relaxation frequency increases with an increase of neutron dose levels and permeability μ'' shifts to higher frequencies Vickers micro hardness and yield strength increased with increase of the dose levels. The results are explained in terms of the increase of inhomogeneity associated with the microstructural nano size defects formed due to neutron bombardment. The magnetic and mechanical property changes showed consistent results for the assessment of radiation embrittlement.

Key Words : Neutron irradiation effect, Ferromagnetic resonance (FMR), Linewidth, RPV, Radiation embrittlement, Complex permeability.