A PAIR-DISTRIBUTION FUNCTION AND RIETVELD ANALYSIS OF AGED U-NB ALLOYS

H.M. Volz, Th. Proffen, R.E. Hackenberg, A.M. Kelly, W.L. Hults, A.C. Lawson, R.D. Field, D.F. Teter, D.J. Thoma,
Los Alamos National Laboratory, Los Alamos, NM, 87545 USA
M.A. Rodriguez
Sandia National Laboratory, Albuquerque, NM USA.

Previously we presented Rietveld refinement results from laboratory X-ray powder diffraction data on artificially aged U-Nb alloys [1,2]. The uranium-niobium alloy system is complex, exhibiting many different stable and metastable phases including martensite and shape-memory behavior. It is desirable to understand any long-term changes in the structure of these materials in order to improve predictions of materials properties over time. Results from the interpretation of possible aging mechanisms from the data were inconclusive, showing lattice parameter trend reversal and the possible presence of planar defects. Our hypothesis focused on formation of coherent precipitates that later relaxed and lost coherency. In order to better understand segregation of niobium atoms, data from NPDF at the Lujan Neutron Scattering Center at LANSCE were collected in order to study pair-distribution functions from select aged specimens. Compositionally homogeneous U-5.6 Nb and U-7.7 Nb (wt%) experimental specimens have been artificially aged by isothermal treatments at temperatures of 373K, 473K, 523K, and 573K for times ranging from 10 to 100,000 minutes. We will first summarize X-ray results from a Cu-Kalpha source, then present observations and new insights of aging-induced changes (or lack thereof) obtained from PDFs. Finally, speculation on aging mechanisms involved will be discussed.

[1] H.M. Volz et.al., "Analysis of X-Ray Diffraction Data From Aged U-Nb Alloys," 2006 Denver X-Ray Conference, Oral Presentation, Denver, CO, August 7-11, 2006.

[2] H.M. Volz et.al, *Journal of Alloys and Compounds*, In press.