XAFS Experiment on Zirconium Based Metallic Glasses

Nimai C. Das[1], Dipankar Nanda[2], Jyh-Fu Lee (李志甫)[3], Yu-Li Tai (戴佑理)[3], and Cheng-An Hsieh (謝承安)[3]

[1]Department of Atomic Energy, Bhabha Atomic Research Center, Mumbai, India
[2]Department of Atomic Energy, Raja Ramanna Center for Advanced Technology, Indore, India
[3]National Synchrotron Radiation Research Center, Hsinchu, Taiwan

Metallic glasses have generated lot of interest for their unique application potential due to their amorphous structure. Zr-based metallic glasses and have been synthesized by melt-spinning method. Although X-ray diffraction (XRD) and high resolution electron microscopy (HREM) have been employed to study the Zr-based metallic glasses, they have been failed to ascertain the structure of clusters in the glassy phase. It was, therefore, proposed to employ XAFS for probing the details of local structure in both the parent glass and nucleated phases so that one can understand the structural correlation of the two phases. XAFS measurements on the Zr-based metallic glasses have been performed at the K-edges of Zr, Cu, Ni and Ti to probe the vicinity of each of the constituent atoms. Based on the experimental data, X-ray absorption curves have been plotted as shown in figures 1 to 4. XAFS data have been collected using synchrotron radiations at NSRRC BL 01C1 and BL 17C1.

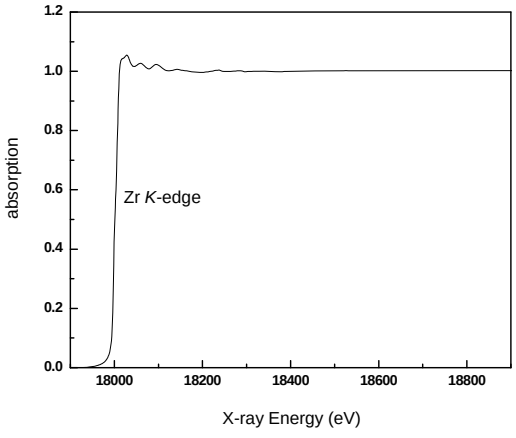

Figure 1. X-ray absorption at Zr K-edge

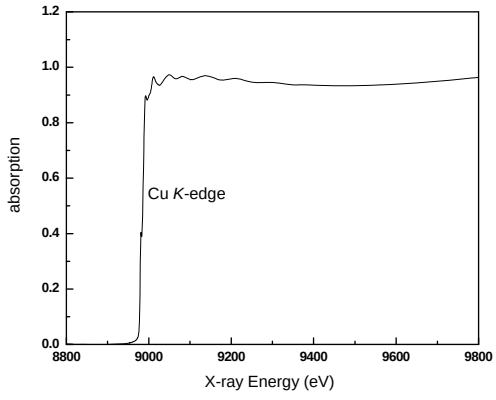

Figure 2. X-ray absorption at Cu K-edge

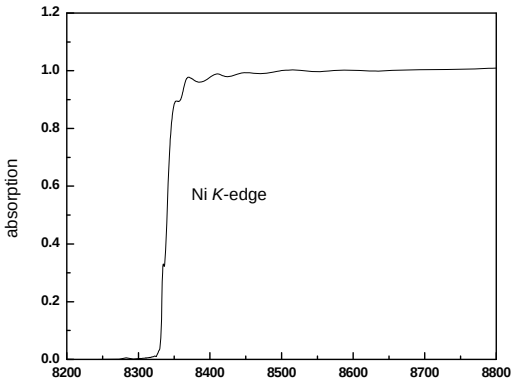

Figure 3. X-ray absorption at Ni K-edge

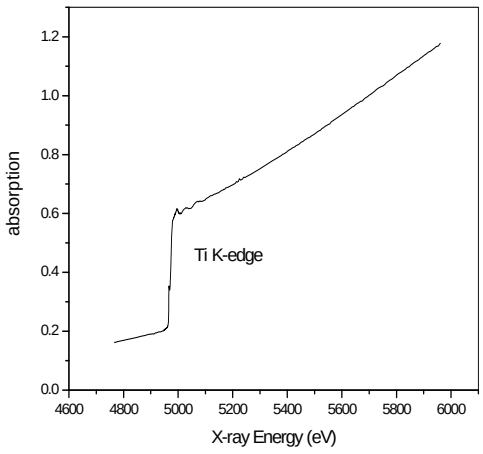

Figure 4. X-ray absorption at Ti K-edge