

CHARACTERIZATION OF ULTRAFINE NANOSTRUCTURES BY X-RAY DIFFRACTION

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Nanocrystalline materials can be obtained upon annealing of an amorphous precursor if a high nucleation rate is combined with a low growth rate. Recently, ultra fine nanostructures were found as the first step of crystallization of Zr- based bulk glasses containing different additions such as Ti , Fe, or Pd. Figure 1 shows X-ray diffraction patterns of amorphous $(\text{Zr}_{65}\text{Al}_{7.5}\text{Cu}_{17.5}\text{Ni}_{10})_{100-x}\text{Fe}_x$ alloys annealed at 723 K for 30 min. The reflections of the NiTi_2 -type phase formed are strongly broadened due to size effect. An average crystallite size of 2-5 nm is estimated for the alloy with 20 at% Fe. Results of Rietveld refinement and atomic pair correlation functions are presented in comparison with transmission electron microscopy investigations.

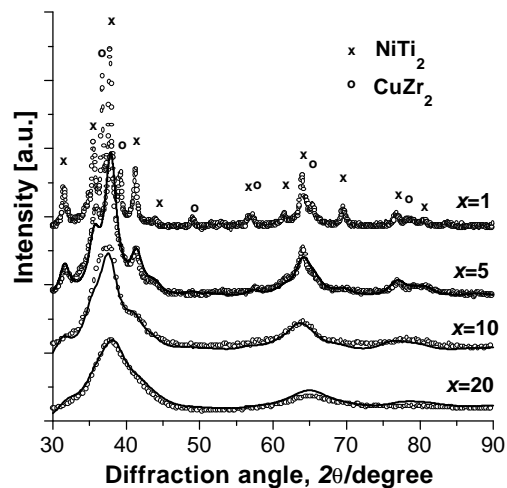


Fig. 1 :XRD of $(\text{Zr}_{65}\text{Al}_{7.5}\text{Cu}_{17.5}\text{Ni}_{10})_{100-x}\text{Fe}_x$ at annealed $T_A=723$ K for 30 min (measured (o) and calculated (-) data)