Cristallographie

Glass forming ability and crystallization behavior of Nickel-based metallic glasses by electronic and calorimetric measurements

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Abstract
Nickel–zirconium-niobium based amorphous alloys are promising hydrogen-selective membrane materials. It was produced by the rapid quenching method, this Amorphous alloys are a promising alternative to Pd alloy membranes for hydrogen separation because of their lower cost and best hydrogen permeability. The temperature dependences of electrical resistivity, absolute thermoelectric power and differential scanning calorimetry (DSC) have been measured and analyzed. A new measuring device for PTA and resistivity measurement using LabView as a support developed by Dr. F.Gasser. A very good agreement between the phase transition temperatures determined using different techniques has been determined. Simultaneous measurements of resistivity and absolute thermoelectric power were performed with a very high degree of accuracy. Glass-forming ability, thermal stability and structural changes of Ni–Nb–Zr metallic glasses have been examined and characterized. The negative resistivity temperature coefficients (RTC) of Ni-Nb-Zr metallic glass alloys corresponding possible values of Fermi energy interpreted by Ziman–Faber theory. In situ measurement of electrical resistivity is a method to control the phase formation and microstructure upon heat treatment of metallic glasses. The change in the electrical resistance of the alloy after non-isothermal heat treatment was investigated, and the activation energy of crystallization Ex was calculated using the Kissinger and Ozawa equations. Ni– Nb–Zr metallic glass has a wide supercooled liquid region and high activation energy of crystallization Ex, which demonstrates the high thermal stability of this glassy alloy. The J-M-A equation has been applied to the isothermal kinetics. The activation energy, calculated from the Arrhenius equation in the isothermal was calculated. As well as the intermetallic phases in Ni–Nb–Zr amorphous alloys after thermal treatment have been investigated by X-ray diffraction (XRD) and scanning electron microscope (SEM).

Keywords: Metallic glass, Electronic transport properties, Activation energy, Phase transitions.