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MICROSTRUCTURAL EVOLUTION OF NI57NB33ZR5CO5 METALLIC GLASS

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The Ni57Nb33Zr5Co5 metallic glass is a promising alloy to be used as bipolar plates in proton exchange membrane (PEM) fuel cells. It is important to know which phase forms in this alloy under different cooling rates in order to investigate its influence in the thermal stability and mechanical properties of this alloy. In this work, different rapid solidified samples were prepared and their phase formation and microstructure were investigated by X ray diffraction (XRD), differential scanning calorimetry (DSC), optical microscopy, and scanning electron microscopy (SEM). It is found that in the samples with the highest cooling rate (ribbons) a fully glassy structure is attained. For the lower cooling rate samples (ingot, 2mm and 3 mm diameter rods), an complete crystalline structure forms with the presence of the equilibrium phases of Ni3(Nb,Zr) and Nb7Ni6 as primary phase or in an eutectic structure. As for the samples with an intermediate cooling rate (1 mm diameter rods) a polymorphic solidification occurs. Crystals of a metastable phase with spherical morphology precipitate in a glassy matrix with virtually the same composition and the spherical morphology is connected with the absence of constitutional undercooling during solidification.