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Zr基非晶合金多孔材料的制备与性能

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摘要: 采用液态金属渗流法制备直径为6 mm的Zr基块体多孔非晶合金, 采用扫描电镜(SEM)和X射线衍射仪(XRD)分析多孔材料的结构、形貌、断口特征和相组成, 同时对多孔非晶合金的孔隙结构和力学特点进行分析。结果表明: 采用CaC₂作为孔隙支撑材料, 能够制备出孔隙分布均匀、孔隙直径为0.2-0.8 mm的多孔非晶合金, 其密度和孔隙率分别为3.57 g/cm³和47%。压缩力学性能实验表明: 该多孔非晶合金的应力-应变曲线具有锯齿状变化规律, 应力逐渐降低, 其最大强度和应变分别为383 MPa和18.6%, 应变量大于单相非晶合金的应变。

关键词: 多孔非晶合金; 渗流铸造; 力学性能

Fabrication and mechanical properties of porous Zr-based bulk metallic glass

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Abstract: A porous Zr-based bulk metallic glass with a diameter of 6 mm was fabricated by melt infiltrating casting method. The porous cell morphology, structure, fracture surface and phase constituent of the porous material were investigated by scanning electron microscopy (SEM) and X-ray diffractometry (XRD), respectively. And the mechanical properties and cell structure were also discussed. The results show that a uniform distribution of porous cells with size of 0.2-0.8 mm forms by introducing CaC₂ particles as space holders. The density and porosity of the porous bulk metallic glass are 3.57 g/cm³ and 47%, respectively. The largest yield strength of this porous material is 384 MPa and it gradually declines accompanied by serrated flow under compression. The final failure occurs at a strain of 18.6%, well in excess of monolithic amorphous alloys.

Key words: porous metallic glass; melt infiltrating casting; mechanical properties

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