Crystallization of Pd40Cu30Ni10P20 bulk metallic glass with and without pressure

The glass-transition behavior of Pd40Cu30Ni10P20 bulk metallic glass was investigated by differential scanning calorimetry (DSC) and X-ray powder diffraction (XRD). The effect of pressure on the crystallization behavior of Pd40Cu30Ni10P20 bulk glass was studied by in situ high-pressure and high-temperature X-ray powder diffraction using synchrotron radiation. Phase analyses show at least six crystalline phases in the crystallized sample, namely, monoclinic, tetragonal Cu3Pd-like, rhombohedral, fcc-Ni2Pd2P, fcc-(Ni, Pd) solid solution, and body-centered tetragonal (bct) Ni3P-like phases. The onset crystallization temperature increases with pressure having a slope of 11 K/GPa in the range of 0 to 4 GPa. The results are attributed to the competing process between the thermodynamic potential barrier and the diffusion activation energy under pressure.

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