[PB]

Materials properties of Cu-based bulk metallic glass powders by gas atomization and extrusion process

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Abstract - $Cu_{54}Ni_6Zr_{22}Ti_{18}$ bulk metallic glass powder was successively prepared and consolidated using a high pressure gas atomization and a warm extrusion, respectively. The $Cu_{54}Ni_6Zr_{22}Ti_{18}$ amorphous powder as atomized has a wide super-cooled liquid range(ΔTx) of about 50K, as well as spherical shape (Fig.1).

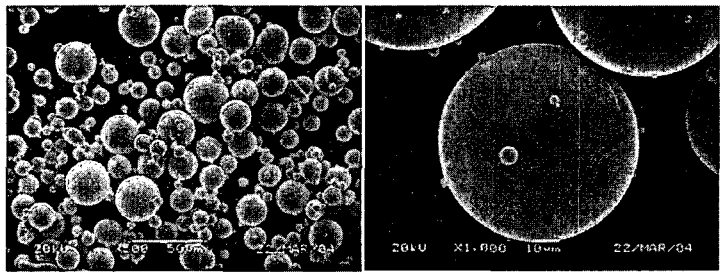

Fig.1. Scanning electron micrographs showing the morphology of gas atomized $Cu_{54}Ni_6Zr_{22}Ti_{18}$ powder with the size distribution.

The thermal stability and phase transformation of atomized powder (Fig.2) and its extruded bulk were investigated using X-ray diffractometer (XRD) and differential scanning calorimeter (DSC) as a function of powder size distribution.

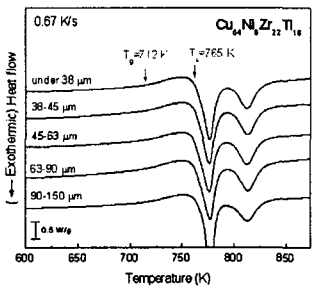

Fig.2. Differential scanning calorimetric traces obtained during continuous heating the gas atomized $Cu_{54}Ni_6Zr_{22}Ti_{18}$ powder with the size distribution.

The bulk extruded with an area reduction ratio of 5 and working temperature of 743K maintains the amorphous structure. The density reaches at 98%, to that of as cast sample. The compressive strength is located between 1.5GPa and 2.0GPa tending to increase as the powder size increases.

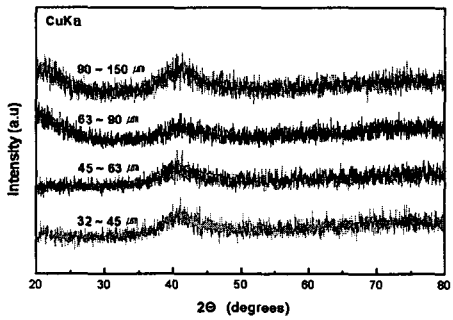

Fig.3. XRD patterns of atomized and extruded $Cu_{54}Ni_6Zr_{22}Ti_{18}$ alloys.