

Designing Amorphous/Crystalline Composites by Liquid-Liquid Phase Separation

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Abstract. The Cu-Zr-Ag system is characterized by a miscibility gap. The liquid separates into Ag-rich and Cu-Zr rich liquids. Yttrium was added to the Cu-Zr-Ag and Cu-Zr-Ag-Al systems and its influence on liquid immiscibility was studied. This alloying element has been chosen to check the effect of the heat of mixing between silver and the given element. In the case of Ag-Y system it is highly negative (-29 kJ/mol). The liquid becomes immiscible in the Cu-Zr-Ag-Y system. To the effect of Y addition the quaternary liquid decomposed into Ag-Y rich and Cu-Zr rich liquids. The Y addition increased the field of miscibility gap. An amorphous/crystalline composite with 6 mm thickness has been successfully produced by liquid-liquid separation based on preliminary calculation of its composition. The matrix was Cu₃₈Zr₄₈Al₆Ag₈ and the crystalline phases were Ag-Y rich separate spherical droplets.