SYNTHESIS AND CHARACTERISATION OF HIGH ENTROPY ALLOYS

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Abstract

High entropy alloys are essentially solid solution alloys that contain multiprincipal elements in simple crystal structure such as Body centered cubic(BCC),Face Centred cubic (FCC) and Hexagonal close packed lattice. Most of multi-component high entropy alloys are designed as equi-atomic or near equi-atomic. The present paper reports synthesis of equi-atomic AlFeNiCrCuTi high entropy alloy by mechanical alloying using Planetary Ball Mill. Alloying behaviour, microstructure and properties of AlFeNiCrCuTi alloy are investigated by X-ray diffraction (XRD), and Differential scanning calorimetry / Differential thermal analysis (DSC/DTA), energy dispersive X-ray (EDX) microanalysis equipped with scanning electron microscope (SEM), respectively. XRD analysis indicates that both BCC and FCC crystal structure phases are observed after Mechanical Alloying. Thermal behaviour of 25 hrs milled powder inspected by DSC technique shows endothermic behaviour and TG curve shows minor weight gain. SEM and EDX microanalysis indicates the homogeneity and the equiatomic composition is maintained in each particle of the alloy. It is found that a solid solution with refined microstructure of approx. 16 nm in grain size could be obtained after 25 hrs milling