

Title: Effects of precipitation on the hardness of ternary rare earth-based metallic glass

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The present study reports temperature effects in the annealing treatment of $Ce_{75}Al_{23}Si_2$ rare earth-based metallic glasses (REMGs). The hardness, phase transfer and morphology analysis of original and annealed $Ce_{75}Al_{23}Si_2$ rare earth-based metallic glasses (REMGs) samples were discussed. The glass-forming ability of melt-spun $Ce_{75}Al_{23}Si_2$ metallic glasses was investigated initially. $Ce_{75}Al_{23}Si_2$ REMGs were annealed at five different temperatures. After each treatment, three characteristic methods, i.e., X-ray diffraction (XRD), scanning electrical microscope (SEM) and microindentation, were conducted on the initial REMGs sample and five annealed samples. XRD peaks demonstrated the crystal structures were generated $Ce_{75}Al_{23}Si_2$ in this treatment and the average crystal size in crystalline samples was calculated by using Debye-Scherrer equation. The relationship between annealing temperature and hardness was discussed. Further study on the electrical resistivity of $Ce_{75}Al_{23}Si_2$ under pressures is planned to understand the transport properties in extreme environments.