Characterization and crystallization kinetics of sputtered NiSi thin films for blue laser optical recording application

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ABSTRACT

In this study, Ni_{31}Si_{69}, Ni_{43}Si_{57} and Ni_{63}Si_{37} thin films with the thickness of 16 nm were deposited at room temperature by co-sputtering using Ni and Si targets. From the result of reflectivity-temperature measurement, it was found the NiSi layers possessed two temperature ranges of reflectivity change, i.e. 150-270°C and 320-370 °C. Microstructural analysis indicated that the NiSi_{2} nano-crystalline phase was formed in the as-deposited state. After annealing at 270 and 500 °C, the crystallinity of NiSi_{2} phase was improved and the Ni_{2}Si phase appeared, respectively. By measuring the optical reflectivity at a wavelength of 405 nm, the optical contrasts of these films before and after annealing for 270 °C were determined to be 24%, 16% and 26% with the Ni contents of 31, 43 and 63 at.%, respectively. The optimum jitter values of Ni_{31}Si_{69} blu-ray disc were 7.7% at 5.7 mW and 8.2% at 7 mW, respectively, for 1× and 2× recording speeds. It reveals that the NiSi films have high potential in the application of blue laser recording media.

Keywords: NiSi, optical recording, write-once blu-ray disc, activation energy, transmission electron micr...