NANOSECOND LASER ANNEALING of NiTi AMORPHOUS THIN FILM

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High actuation speed and fast response with precise control of deformation and strain is the most important propriety in NiTi thin film usable in micro actuators and micro electro mechanical systems (MEMs). In this research, NiTi amorphous thin film produced by sputtering was nanosecond laser-treated under different power densities and frequency rates of laser. The thin film produced was characterized by transmission electron microscope (TEM), scanning electron microscope (SEM) with secondary electrons (SE) detector, field emission of scanning electron microscope (FESEM), and optical microscope (OM). Control over location/distribution of crystalline regions provides a method for obtaining possibility of shape memory response. Pulsed laser annealing is preferential to continuous wave laser annealing because of reducing the partially crystallized sharp interfaces between amorphous and crystallized areas. Due to laser induced thermal distribution on thin film, cracking is started from holes caused by nanosecond pulse duration have direct accompanied with rising of laser beam intensity. Also low interaction times of pulsed laser with NiTi reduce the probability of oxidation of thin film and have the least substrate thin film interaction. In this work, microstructural changes as well as, morphology, shape and precipitate size have basically been observed after a few pulses annealing treatment. Also in high laser energy new different precipitants with new combinations appeared is discussing completely.

Keywords: NiTi thin film, Nanosecond laser annealing, Crystallized regions, Shape memory