

Sangthum Srikomol 2012: The Direct Current Electrochemical Codeposition and Heat Treatment of Ni-Ti Films. Master of Engineering (Materials Engineering), Major Field: Materials Engineering, Department of Materials Engineering. Thesis Advisor: Mr. Ratchatee Techapiesancharoenkij, Ph.D. 101 pages.

The direct current electrochemical codeposition was a cost effective and unsophisticated method. This research studied a possibility of using direct current electrochemical codeposition method and heat treatment to produce NiTi films. The effects of Ti particle sizes of -22 and -45 micron, current densities of 100 - 250 mA/cm<sup>2</sup>, and particle concentrations of 0.1 to 30 g/dm<sup>3</sup> were investigated. The chemical compositions and morphology were characterized using scanning electron microscope (SEM), x-ray diffraction (XRD), energy dispersive spectroscopy (EDS), and x-ray fluorescence (XRF). The experimental results showed that 40 at. % film could be codeposited at 200 mA/cm<sup>2</sup> by 8 g/dm<sup>3</sup> of -45 micron Ti particles. Notably, particle size as well as particle concentration strongly affected the film's chemical compositions and morphology while the effects of current density were not clearly presented.

The NiTi films containing 40 at. % were heat treated at 1100 °C for 5 hours. The heat-treated film showed Ni<sub>3</sub>Ti and NiTi phases, which correspond well with the Ni-Ti phase diagram. Moreover, TiN phase also appeared in the sample, which may be due to the reaction of Ti and retain N<sub>2</sub> in furnace atmosphere. The presented TiN phase might result in a reduction of available Ti to react with Ni; as a result, the NiTi fraction is lower than expected. Noticeably, the presence of NiTi phase showed the feasibility of NiTi film produced by a direct current electrochemical codeposition with subsequent heat treatment.

---

Student's signature

Thesis Advisor's signature