

Thesis Title	Influences of Temperature and Cooling Rate on the Microstructure and Hardness of a Nickel Aluminum Bronze Alloy.
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Candidate	Miss Jutamas Anantapong
Thesis Advisors	Assoc. Prof. Dr. Surasak Suranuntchai Dr. Anchalee Manonukul
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Abstract

The aim of this research was to investigate the influences of temperatures and the hot deformation conditions on the resultant microstructure and hardness of a nickel aluminum bronze (NAB) alloy. Several NAB alloy specimens were annealed at temperatures between 750 and 1,000°C and rapidly cooled to room temperature. The results indicated that the phase transformation of the NAB alloy was strongly influenced by the annealing temperature. The volume fraction of the β' phase was increased with increasing annealing temperature. Due to the β' phase being the primarily contributor to the hardness of the NAB alloy, the hardness of the specimens was increased due to the increased volume fraction of the β' phase. To investigate the influence of the hot deformation conditions, including processing temperature and cooling rate, experiments were carried out using a dilatometer. The NAB alloy specimens were processed at temperatures between 800 and 950°C and subsequently cooled at a rate of 40 or 100°C/s. The results indicated that the peak flow stresses in the specimens decreased with increasing processing temperature. The cooling rates had an effect on the microstructure of the specimens. Specifically, the amounts of β' phase and Widmanstatten α phase were increased as the cooling rate was increased. As a result, the harnesses of the specimens cooled at 100°C/s was higher than that of the specimens cooled at 40°C/s.

Keywords : Nickel aluminum bronze / Temperature / Cooling rate / Microstructure / Hardness