

AGING BEHAVIOR OF Al-Mg-Ge ALLOYS WITH DIFFERENT ALLOYING ELEMENTS

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INTRODUCTION

Kawai et al. reported that precipitation sequence of Al-Mg-Ge alloy is different from Al-Mg-Si alloy¹). Particularly, Al-Mg-Ge alloy showed high peak aging hardness even at 523K compared to Al-Mg-Si. However, few reports are available about alloying effect on Al-Mg-Ge alloy. The aim of this research is to understand the effect of alloying elements on age-hardening behavior and mechanical property variation of Al-Mg-Ge alloy.

MATERIALS & METHODS

The chemical compositions of the alloys are Al-0.43%Mg-0.20%Ge (at. %) alloy (base alloy). And 7 kinds of alloys with alloying elements of Ag, Cu, Cr, Si were prepared in this research. Ag, Cu, and Cr added 0.2at. % and Si added 0.4at. %. Aging treatment was carried out at the temperatures of 473K and 523K. Vickers microhardness measurement was conducted to estimate the mechanical properties of alloys using Mituyoyo HM-101 (load: 0.98 N, holding time 15 s). TEM observation was conducted using Topcon, EM-002B with accelerated voltage of 120 kV

RESULTS

Figure 1 shows age-hardening curves aged at 473K. Every alloy with Cu containing, maximum hardness increased compared to base alloy. With Ag addition, hardness increased quickly at the initial stage of aging. In the case of Ag-Cu-Cr-Si added alloy shows the highest hardness values.

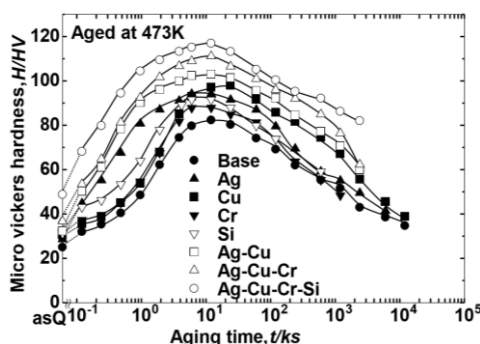


Figure 1. Age-hardening curves aged at 473K

Peak aging, needle or rod-like precipitation along $\langle 100 \rangle_{Al}$ was observed (Figure 2). AgCuCrSi added alloy, the cross section of some needle or rod-like shape precipitation was elongated. All alloys of

Ag-Cu-Cr-Si added alloy showed the higher density of precipitation than base.

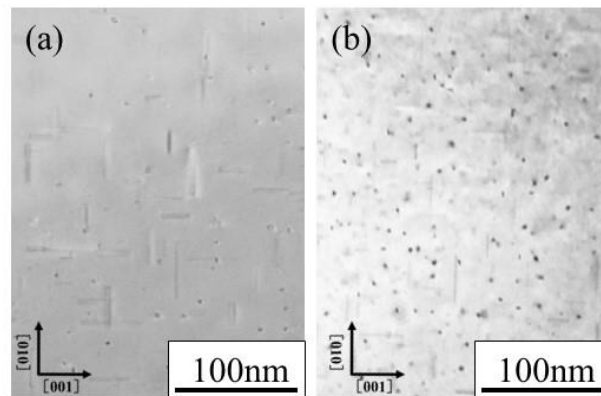


Figure 2. Bright field images of (a) base (b) AgCuCrSi alloy aged at 473K for 200 min

REFERENCES

Matsuda, K., Munekata, T., Kawabata, T., Uetani, Y., & Ikeno, S. (2004). *Journal of J. Inst. Light Metals*, 56(11), 680-684.

KEYWORDS

Al-Mg-Ge alloy, TEM, Age-precipitate