Institute of Light Metals (ILM) Joint Usage/Research Grant Report in FY 2023

2024/00/00

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| Principal investigator | Affiliation | Norwegian University of Science and Technology |
| Job title | Professor |
| Name | Knut Marthinsen |
| Collaborated researcher of ILM | Affiliation | University of Toyama |
| Job title | Associate Professor |
| Name | Seungwon LEE |
| Title of the joint research | Microstructure observation of cold-rolled Al-Mg-Ge alloy |
| Joint research Program※check the box | □　Program for Joint Usage / Research Centers (JURC)☑　Program for International JURC□　Program for providing samples and materials□　Program for using ILM facilities for sample analysis and characterization | □ Focused themes☑ Transportation□ Biomaterials□ Bridge/building materials□ Kink strengthening□　Independent research theme |
| Name of joint usage apparatus | Casting,　TEM |
| Total amount of grant | Travel expense（　240,000　JPY） | Consumable Fee ( 60,000　JPY） |
| **Research Results**　**※Please describe following three items briefly.**【The major results】Al-Mg-Ge alloys, like Al-Mg-Si alloys, are treated as Al-Mg2Ge pseudo-binary alloys. Al-Mg-Ge alloys have a higher age-hardening ability than Al-Mg-Si alloys even at high temperature aging, and the aging precipitation process is basically the same as that of Al-Mg-Si alloys. Al-Mg-Si alloys can be processed and aged after solution treatment, and it has been reported that elongation and strength can be improved by applying thermomechanical treatment. In this study, Al-1.0mass% Mg2Ge alloys are cold-rolled after solution heat treatment, and the difference in age-hardening behavior at each rolling speed is investigated by hardness measurement and microstructural observation. As a result of measuring the hardness of Al-1.0 mass% Mg2Ge alloy at each rolling rate aged at an aging temperature of 473K, the hardness of as R. increased as the rolling rate increased. In this alloy, there was no difference in peak hardness depending on the rolling rate at an aging temperature of 473K. Age hardening ability tended to decrease, but the time to reach maximum hardness became shorter. As a result of TEM observation at the highest hardness of the 0% rolled material, rod-shaped precipitates extending along the <100> direction of the Al matrix and granular contrast, which is thought to be the cross section, were observed. As a result of TEM observation at the highest hardness of the 10% rolled material, it was confirmed that dislocations were introduced, and in the dislocation phase, precipitates that grew coarser than the precipitates in the particles were observed. In addition, through HRTEM observation of aging precipitates at the highest hardness of 10% rolled material, β' phase was observed in the intragranular and dislocation phases.【Future Prospects】It was confirmed that work hardening and precipitation strengthening of the Al-1.0 mass% Mg2Ge alloy can occur simultaneously, resulting in an increase in material strength. Compared to the Al-1.0 mass% Mg2Si alloy, it has excellent high-temperature characteristics, so research should continue as it has potential as a replacement for Al-1.0 mass% Mg2Si.【Concrete results】Nothing in particular　　 |
| **Notes**・Please use the form and submit to ILM office (mrc@kumamoto-u.ac.jp) by Friday, April 28, 2023.・The joint research report will be published in the ILM joint research report (annual report) and will be available on our website. Therefore, please prepare the contents for public release accordingly.・Please add pages, if needed. |