Institute of Light Metals (ILM) Joint Usage/Research Grant Report in FY 2022

2024/00/00

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Principal investigator | | Affiliation | SINTEF industry | | |
| Job title | Senior Scientist | | |
| Name | Calin Daninel Marioara | | |
| Collaborated researcher of ILM | | Affiliation | University of Toyama | | |
| Job title | Professor | | |
| Name | Kenji Matsuda | | |
| Title of the joint research | | Age-hardening in Al-Zn-Mg (-Cu) alloys with low Zn / Mg ratio | | | |
| 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-Zn-Mg alloys are called 7000 series aluminum alloys, and are the strongest alloy system among aluminum alloys. It is known that increasing the Zn/Mg ratio or adding Cu promotes the precipitation of the η phase and increases the strength, but the specific gravity increases. On the other hand, decreasing the Zn/Mg ratio reduces the specific gravity and causes the precipitation of the T phase, which is stable even at high temperatures. There have been few detailed studies on the age-hardening ability and microstructure of the T phase. The purpose of this study is to clarify the effect of Cu addition on the age-hardening behavior of Al-Zn-Mg alloys with low Zn/Mg ratios. Optical microscope observation was conducted using ZM42HC(without grain refiner) and ZM42HCTZ(with Grain refiner) after solution treatment. As a result of the average grain size measurement, the crystal grain size was reduced from 308 μm to 5 μm by adding a refiner. As a result of hardness measurement, there was no significant difference between the two alloys in the hardness immediately after solution treatment and the highest hardness at 393 K. As a result of a tensile test conducted on a sample aged at 393K to the maximum hardness, the maximum tensile strength and elongation increased by adding a refiner. As a result of TEM observation of the sample aged at 393K to the maximum hardness, no significant difference was seen in the number density of precipitates per unit area due to the addition of the refiner, but the width of the PFZ decreased. From the SAED diagram, in addition to the diffraction spots on η', η1, and η2, a diffraction spot thought to be Al3Zr was visible.  【Future Prospects】  Quantitative results were obtained on the change in mechanical properties due to heat treatment of the material when copper and grain refiner were added to the 7000 series aluminum alloy. However, because the role of Cu in the precipitates has not been clearly identified, research must continue.  【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. | | | | | |