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

2024/00/00

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| 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 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】  This research, as an extension of last year's research, produced alloys with different addition ratios of Zn and Mg, observed changes in the mechanical properties of the materials during heat treatment, and observed the microstructure structure. Hardness measurements were conducted at an aging temperature of 393K, 423K, and 473K. In 393K and 423K conditions gave a similar result that ZM44TZ gave the highest hardness, followed by ZM53TZ with an aging duration similar to ZM44TZ, and finally, ZM35TZ gave the lowest hardness. While 473K condition, the highest hardness is ZM53TZ, followed by ZM44TZ and ZM35TZ. Next, each sample was aged to the maximum hardness at 393K, 423K, and 473K, and conducted the tensile test. The nominal stress of the alloys from highest to lowest is ZM44TZ, ZM53TZ, and ZM35TZ. Conversely, when considering elongation, the order from highest to lowest are ZM35TZ, ZM53TZ, and ZM44TZ. TEM observations revealed the presence of precipitates in all alloys that appeared as grains or rods. Variations in grain contrast were noticed within the grain and along the grain boundary. The number density of the precipitates from high to low number are ZM44TZ, ZM35TZ, and ZM53TZ in all temperatures, and they were noticed that 393K affected all alloys to fabricate more precipitates while 473K slightly affected all alloys in precipitates formation.  【Future Prospects】  Changes were observed during heat treatment of Al-Zn-Mg alloy when the amount of added solute atoms was the same but the ratio was different. As basic research, it is considered necessary to study the precipitation hardening behavior when the addition ratio of Zn and Mg is different.  【Concrete results】  Dr. C. D. Marioara stayed at Univ. Toyama from Dec. 2023 – March 2024 as an employee of ARC by cross-appointment to do co-operative research together with us described above using new STEM at ARC. He will come to Toyama I the FY2024, again. | | | | | |
| **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. | | | | | |