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

2024/05/15

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| Principal investigator | | Affiliation | Charles University | | |
| Job title | Assistant Professor | | |
| Name | Daria Drozdenko | | |
| Collaborated researcher of ILM | | Affiliation | Institute of Light Metals / Magnesium Research Center | | |
| Job title | Director | | |
| Name | Prof. Yoshihito Kawamura | | |
| Title of the joint research | | Thermal stability of dilute Mg-Zn-Y/Gd-based alloys prepared by rapid solidification | | | |
| Joint research Program  ※check the box | | □　Program for Joint Usage / Research Centers (JURC)  **X** 　Program for International JURC  □　Program for providing samples and materials  □　Program for using ILM facilities for sample analysis and characterization | | | □ Focused themes  □ Transportation  □ Biomaterials  **X** Bridge/building materials  □ Kink strengthening  □　Independent research theme |
| Name of joint usage apparatus | | Material preparation: melting furnace, rapid solidification machine, extruder;  Sample preparation: lathe, cutting machines;  Basic microstructure analysis (chemical composition and optical microscopy):  ICP Emission Spectroscopy SHIMADZU　ICPS-8100,  Confocal microscope Lasertec OPTELICS HYBRID | | | |
| Total amount of grant | Travel expense（ 160 000 JPY） | | | Consumable Fee（　140 000 JPY） | |
| **Research Results**　**※Please describe following three items briefly.**  【The major results】  The project was focused on revealing the thermal stability of the microstructure of Mg-0.56Zn-1.5Gd and Mg-0.56Zn-1.5Y alloys prepared by the rapidly solidified ribbon-consolidation (RSRC) technique. Both alloys in the initial state are characterized by a very fine grain structure with an average grain size about 700-900 nm with a dispersive Zn- and Gd/Y-rich stacking faults formed in basal planes. The random orientation of fine grains results in a weak basal texture with a more pronounced intensity at the (10-10) pole. To reveal the thermal stability of the microstructure, isothermal annealing in a range of 300 C - 500 C was applied for both alloys. It was found that the microstructure is stable with increasing annealing temperature up to 400 C in case of Mg-Zn-Y alloy, and up to 350 C in case of Mg-Zn-Gd alloy. With further temperature increase, the growth of the grain size and changes in the texture of the alloy, particularly, redistribution of the intensity at the (10-10) pole, has been observed, which is related to the recrystallization process. The order of dispersion of the solute-segregated stacking faults was found to be rather independent of the thermal treatment. Development in grain size growth is well correlated to development of microhardness values.  【Future Prospects】  The thermal stability of dilute Mg-1.5Y-0.56Zn/Gd (at.%) alloys with microalloying (up to 0.4at.%) of biocompatible Ca, Mn, Nd elements will be revealed in scope of optimalization of the developed material.  【Concrete results】  The obtained results were partly presented in scope of plenary talk entitled “High strength dilute Mg alloys prepared by rapid solidification” given by D. Drozdenko at The "5th International Conference on Light Materials – Science and Technology (LightMAT 2023) Congress & Exhibition”, Trondheim, Norway  Obtained results will be also summarized into common publications in journals with an impact factor. | | | | | |
| **Notes**  ・Please use the form and submit to the URL provided in the email by Friday, May 10, 2024.  ・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. | | | | | |