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

2024/04/24

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| Principal investigator | | Affiliation | Institute of Physics of Czech Academy of Science | | |
| Job title | Post-Doc | | |
| Name | Drahomir Dvorsky | | |
| Collaborated researcher of ILM | | Affiliation | Magnesium Research Center | | |
| Job title | Professor | | |
| Name | Yoshihito Kawamura | | |
| Title of the joint research | | The influence of extrusion conditions on mechanical properties of Mg-Y-Zn alloy with Mille-Feuille microstructure. | | | |
| 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 | | Magnesium Research Center | | | |
| Total amount of grant | Travel expense（300000　　　　　　　　　JPY） | | | Consumable Fee（　　　　　　　　　　JPY） | |
| **Research Results**　**※Please describe following three items briefly.**  【The major results】  The difference of rapid solidification and ingot metallurgy was observed on Mg-Y-Zn alloy prepared by extrusion. It was investigated that the use of rapid solidification is superior to the common ingot metallurgy in means of mechanical properties. Otherwise, due to slight oxidation there is small depletion of Y in the solid solution that is consumed for the creation of Y2O3 layer that led to slightly lower corrosion resistance and ignition temperature. Another aspect of the work was focused on the extrusion conditions. It was investigated that with higher extrusion ratio there is higher content of DRX grains which leads to lower strength, however, higher ductility. Similarly higher extrusion ratio led to higher DRX content. DRX grains are aligned along the prolonged, deformed grains. Therefore, with extrusion ratio 12.5 and 17.5 the DRX regions become continuous, and the deformation occurs predominantly in these regions that lead to high ductility and low strength. Contrary, lower extrusion ratios consist predominantly of non-DRX grains with basal texture and kinks which significantly increase the strength of these materials and retains at least some elongation due to DRX regions.  【Future Prospects】  It was investigated that the presence of kinks improves strength significantly if they are combined with basal texture. Therefore, the future prospects lie in the suitable method for introduction of kinks into the material and exploiting synergic effects of basal texture, kinks and DRX grains.  【Concrete results】  　●Publication  Currently, there is one submitted joined publication in Journal of Magnesium and Alloys. And another one is in preparation. | | | | | |
| **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. | | | | | |