Institute of Light Metals (ILM) Joint Usage/Research Grant Report in FY 2024

2025/MM/DD

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| Principal investigator | Affiliation | Institute of Physics |
| 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 | Strengthening of Mg-Y-Zn alloy by introducing kinks into microstructure prior to extrusion |
| 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 pre-deformation prior to extrusion significantly increased the tensile yield strength (by 60 MPa) and ductility of Mg-0.4Zn-1Y alloy due to the presence of higher number of kinks in the microstructure. A novel preparation method based on the extrusion of pre-deformed cubes (3x3x3mm) also resulted in improved properties due to the use of hot vacuum pressing which also introduced kinks into the microstructure. Otherwise, pre-deformation of cubes by milling or pressing only increased the presence of oxygen on the interface between particles resulting in increased brittleness. Nevertheless, the harmonic microstructure was successfully prepared by extrusion of milled cubes. 【Future Prospects】Pre-deformation is a suitable method for improving mechanical properties of materials with Mille-Feuille structure due to the introduction of kinks into the microstructure. A novel preparation method consisting of compacting cubes in different states provided an interesting result, however, the problem with oxide interface needs further technological improvement.【Concrete results】　●Publication – results will be published in the conference proceedingsOtherwise, there are two joint publications associated with the topic:Dvorský, D.; Kawamura, Y.; Inoue, S.-I.; Nishimoto, S.; Kubásek, J.; Boukalová, A.; Čavojský, M.; Heller, L.; Duchoň, J.; Vojtěch, D., Exploring kink strengthening in WZ21 magnesium alloy via slow solidification and extrusion. J. Magnes. Alloy 2025.Dvorský, D.; Inoue, S.-I.; Yoshida, A.; Kubásek, J.; Duchoň, J.; de Prado, E.; Školáková, A.; Hosová, K.; Svora, P.; Kawamura, Y., Advantages of rapid solidification over casting of Mg-0.4Zn-1Y alloy. J. Magnes. Alloy 2024, 12 (7), 2847-2862.　●Invited lecture – results will be presented on the Thermec 2025 conference in Tours as an invited lecture. |
| **Notes**・Please use the form and submit to the URL provided in the email by Friday, May 16, 2025.・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. |