(ILM Joint Usage/Research)

Institute of Light Metals (ILM) Joint Usage/Research Grant Report in FY 2025

2026/04/20

Principal investigator	Affiliation	Charles University
	Job title	Professor
	Name	Prof. Kristian Mathis
Collaborated researcher of ILM	Affiliation	Kumamoto University - Magnesium Research Center
	Job title	Professor
	Name	Prof. Yoshihito Kawamura
Title of the joint research	Investigation of kink mechanism in Mg-Y-Zn alloys using advanced in-situ techniques	
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 device, light optical microscope	

Total amount of grant	Travel expense (300.000 JPY)	Consumable Fee (JPY)

Research Results ※Please describe following three items briefly.

【The major results】

All experiments proposed in the project were successfully performed. By combining in-situ SEM deformation with acoustic emission (AE) on full LPSO micropillars, we obtained fundamental insights into the triggering mechanisms of kinking. A significant dislocation activity was observed prior to the formation of large kinks. Two distinct kinking modes were identified depending on orientation: smooth kinking, characterized by continuous bending, and sharp kinking, associated with the formation of well-defined wedges. AE measurements revealed markedly different triggering mechanisms for these modes, with substantially higher AE activity accompanying sharp kinks. Finite-element modeling was carried out and showed good agreement with experiments, particularly in describing stress concentration prior to the onset of kinking. Micropillar-scale observations were further compared with bulk experimental data, revealing similar characteristic patterns in the AE response.

【Future Prospects】

Current work focuses on machine-learning-based analysis of AE signals, aiming to extract fine details of the deformation and kinking processes in full LPSO alloys. In addition, the experimental results will be systematically compared with molecular dynamics simulations to bridge length scales and deepen the mechanistic understanding of kinking and dislocation activity.

【Concrete results】

●Publication – Two scientific publications based on the project results are currently in preparation.

●International conference presentation incl. invited lecture – Kristián Máthis will present a plenary talk at the International Symposium on Physics of Materials in Prague, September 2026

Notes

・Please use the form and submit to the URL provided in the email by Friday, May 15, 2026.
・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.