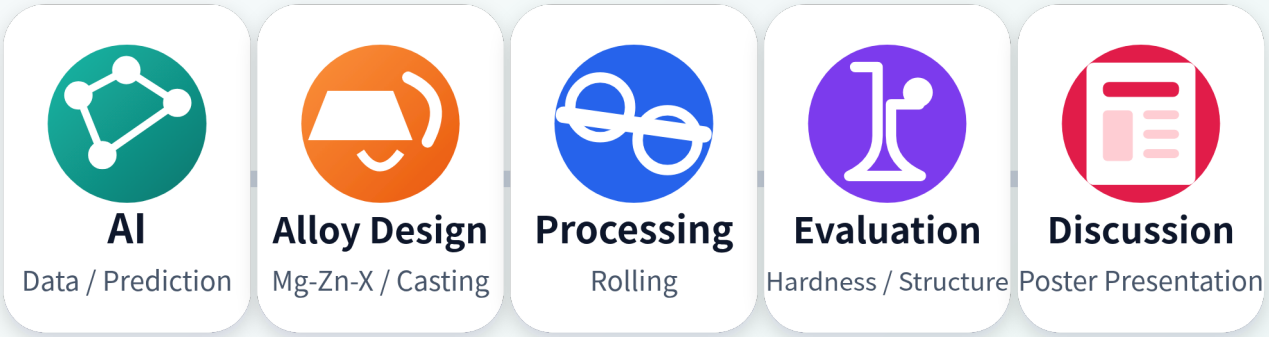
CREATIVE ENGINEERING TRAINING PROGRAM

AI-Driven Development of New Magnesium Alloys



Background and Objectives

Magnesium (Mg) is the lightest practical structural metal and offers major potential for reducing the weight and energy consumption of transportation systems. However, simultaneously achieving high strength, good formability, and corrosion resistance remains challenging. Alloying elements and processing conditions must therefore be designed for the intended application. Materials informatics, which uses machine learning to analyze past experimental data and search efficiently for promising compositions, is increasingly accelerating alloy development.

This program focuses on Mg-Zn-X alloys, in which a third element X is added to an Mg-Zn base alloy. Students will combine machine-learning predictions with melting, casting, rolling, hardness testing, and microstructural observation. By comparing AI predictions with experimental results, they will investigate why predictions agree or disagree and learn how processing, microstructure, and properties are connected. Through repeated interaction between data analysis and experiments, students will experience the complete process of creating a new alloy and communicating research outcomes.

Program Schedule (8 Sessions)

Session 1
Orientation, research background, properties of magnesium alloys, and the objectives of the program

Session 2
Basic concepts of alloy design and the expected roles of the third alloying element X

Session 3
Fundamentals of machine learning and hands-on analysis of composition-property data

Session 4
Prediction and selection of promising Mg-Zn-X alloy compositions using AI

Session 5
Preparation of selected alloys by weighing, melting, and casting

Session 6
Rolling experiments, measurement of thickness reduction, and evaluation of cracking and formability

Session 7
Hardness testing, microstructural observation, data analysis, and comparison with AI predictions

Session 8
Interpretation of results, discussion of prediction errors, and preparation of the final research poster

Instructors
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Maximum enrollment
10 students

Schedule
Third Quarter, Fridays, 5th period

First session
Friday, October 2, 16:20

Meeting place
Room 1016, 10th Floor, Engineering Research Building
Assoc. Prof. Daisuke Ando's Office