

Applied Physics Research Laboratory

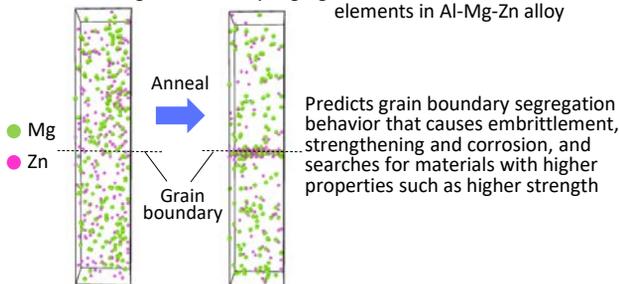
Based on state-of-the-art physics such as materials physics design and electric/magnetic control, we undertake R&D to strengthen the competitiveness of the material- and machinery-related businesses in the KOBELCO Group, and also develop basic technologies common to the Group.

Materials Physics Design

- Physical Analysis of Atomic-to-Nano Scales
- Materials Design and Property Estimates Using Computer Science
- Development of Thin Film Materials, Hard Film Materials, and Magnetic Materials

- Search for high-strength and high-function materials using computer science.

Prediction of grain boundary segregation behavior of additional elements in Al-Mg-Zn alloy

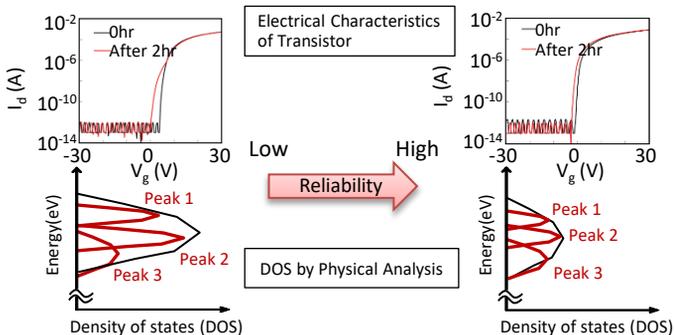


Prediction Technology of Grain Boundary Segregation by First Principle Calculation and Monte Carlo Simulation

Applications to Products and Processes

Steel and aluminum

- Design criteria for thin film composition and process development based on the cause and density of defect levels obtained by physical analysis.



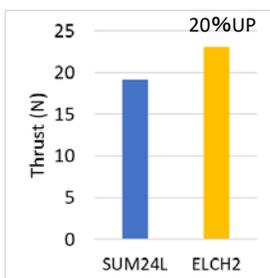
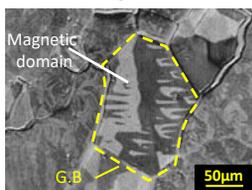
Development of Process Solutions for Electrical Materials using Physical Analysis

Applications to Products and Processes

Oxide semiconductor materials

- Development of soft magnetic materials for higher efficiency and smaller electromagnetic devices.

Microstructure control and evaluation of magnetic characteristics



Magnetic Field Analysis and Magnetic Characterization

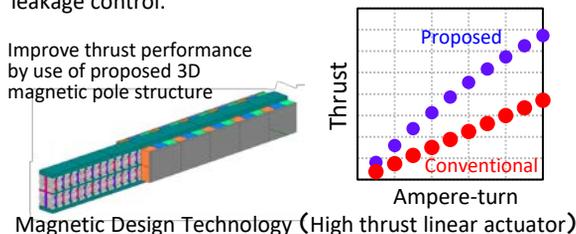
Applications to Products and Processes

Materials for Electromagnetic devices

Electric & Magnetic Control

- Design, Analysis, and Prototype Manufacture of Electric/Magnetic Circuits and Devices
- Control of High Voltage, High Current, and High Magnetic Fields
- Electromagnetic Fluid Control Technology

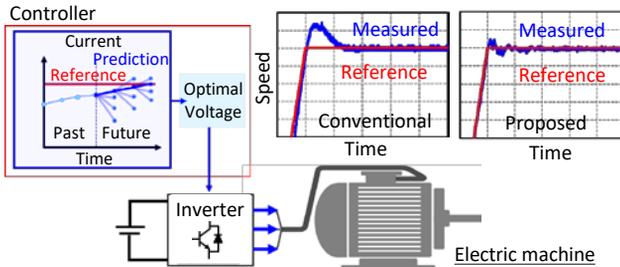
- Use of our core technology, i.e. coupled simulations of electromagnetism, heat transfer, stress, and control, for original electric motor development and magnetic field leakage control.



Applications to Products and Processes

Motors and superconducting magnets

- Developed electric motors and control systems with improved energy-saving and power performance for construction machineries and compressors, achieving high-level machine operations.



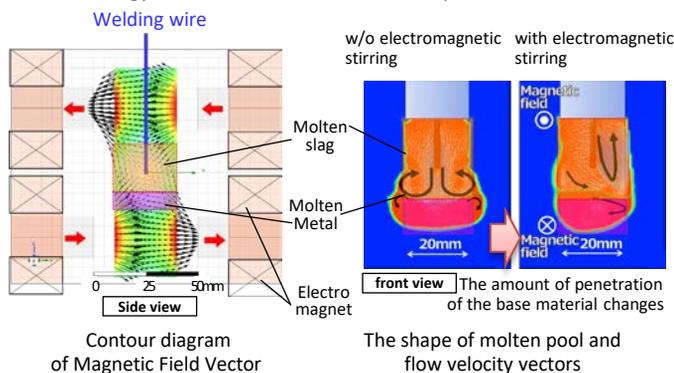
Control Technology for Driving Electric Motors

(Predictive Control)

Applications to Products and Processes

Electric motors for construction machineries and compressors

- The electromagnetic thermal-fluid simulation and control are the core technologies. An electromagnetic processing technology for materials has been developed.



Electromagnetic Fluid Control Technology

Applications to Products and Processes

Electroslag Welding