

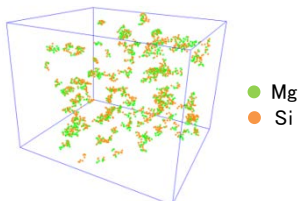
Applied Physics Research Laboratory

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

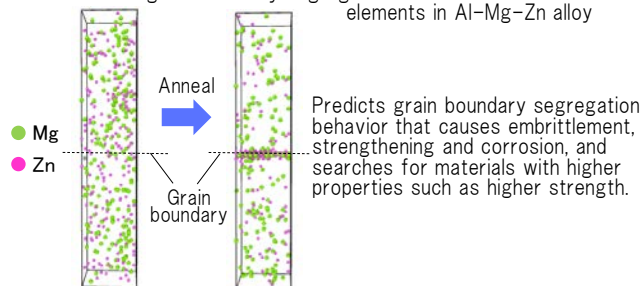
- Develop methodology for such as cluster identification, from a three-dimensional atom map obtained by atomic scale analysis; Aiming to improve characteristics of materials, i.e. strength and formability, etc.



Three-dimensional Atom Map of Identified Clusters in an Aluminum Alloy

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

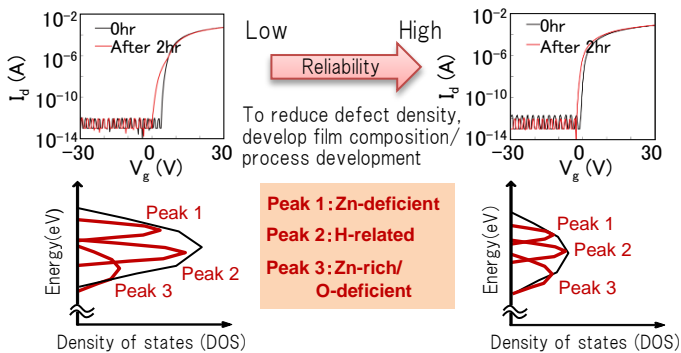
Prediction of grain boundary segregation behavior of additional elements in Al-Mg-Zn alloy



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.



Electrical Characteristics of Transistor (upper) and DOS (lower)

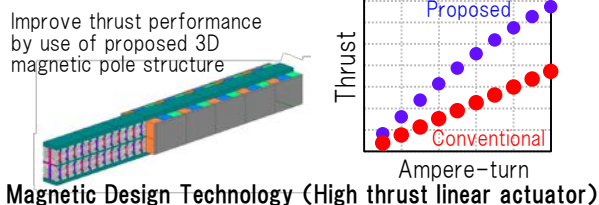
Development of Process Solutions for Electrical Materials using Physical Analysis

Applications to Products and Processes
Oxide semiconductor materials

Electric & Magnetic Control

- Design, Analysis, and Prototype Manufacture of Electric/Magnetic Circuits and Devices
- Control of High Voltage, High Current, and High Magnetic Fields
- Control of Cryogenic Temperature and Device Design

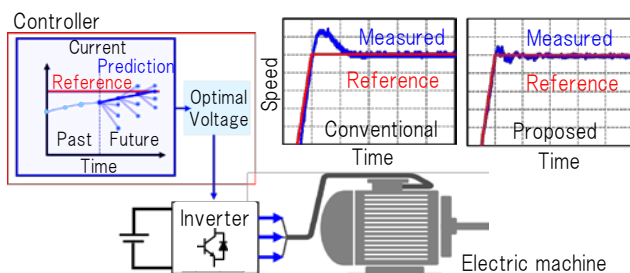
- Use of our core technology, i.e. coupled simulations of electromagnetism, heat transfer, stress, and control, for original electric motor development and magnetic field leakage control.



Magnetic Design Technology (High thrust linear actuator)

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.



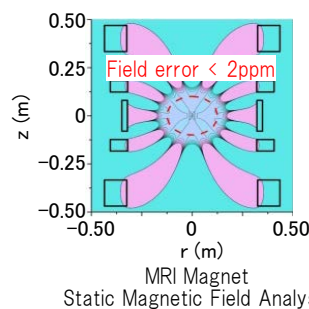
Control Technology for Driving Electric Motors (Predictive Control)

Applications to Products and Processes
Electric motors for construction machineries and compressors

- Developed a superconducting magnet for NMR with the world's highest magnetic field by high magnetic-field stable-design technology. (1.02 GHz/24.0 T as of 4/17/2015)



High Temperature Super-Conducting Coils for MRI



MRI Magnet Static Magnetic Field Analysis

Control Technology for High Voltage and High Magnetic Field

Applications to Products and Processes
High temperature superconducting magnets with high magnetic fields