Brief Profiles of Group Members

Bringing Diverse Expertise Together to Create New Materials

Kazunari YAMAURA | Group Leader

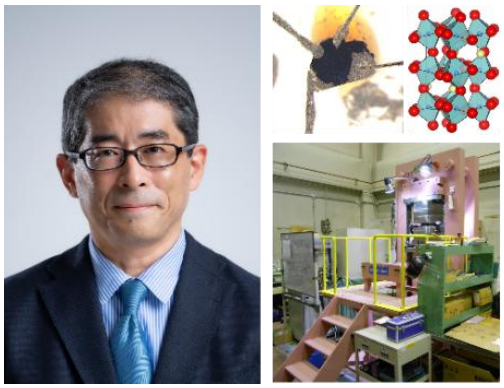
New materials exploration, high-temperature and high-pressure synthesis, single-crystal growth, structural and physical-property characterization

We create new oxides and quantum materials using a variety of approaches, with a particular emphasis on high-temperature and high-pressure synthesis.

By combining precise structural analysis with magnetic and transport measurements on materials with metastable phases and complex crystal structures, we seek to discover new quantum functionalities and clarify the mechanisms underlying them.

As a professor in the Hokkaido University–NIMS Joint Graduate School Program, he supervises doctoral students.

As a visiting professor at Tohoku University, he supervises master's and doctoral students.



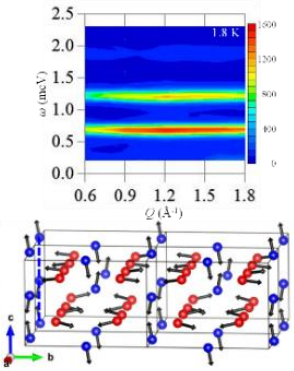
Masashi HASE | Chief Researcher

Quantum magnetism, X-ray and neutron scattering, magnetic structures, magnetic excitations

We investigate crystal and magnetic structures using X-ray and neutron diffraction, and study magnetic excitations using inelastic neutron scattering.

Our aim is to determine how atoms and spins are arranged in newly synthesized materials and what kinds of quantum states they form.

By combining bulk-property measurements, such as magnetization and heat capacity, with quantum-beam techniques, we seek a microscopic understanding of low-dimensional and quantum magnets.



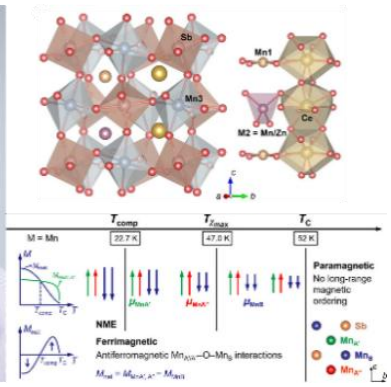
Alexei A. BELIK | Chief Researcher

High-pressure synthesis, perovskite crystal chemistry, multiferroics, low-dimensional magnets

Using high-pressure synthesis, we explore new materials in which ferroelectricity, magnetism, and structural phase transitions are mutually coupled.

We precisely control chemical compositions and crystal structures in perovskite-related materials, including compounds in which multiple cations are ordered over distinct crystallographic sites.

By clarifying how elemental arrangements and crystal symmetry influence magnetism, dielectric properties, and magnetocaloric effects, we aim to create materials with unexpected functionalities.



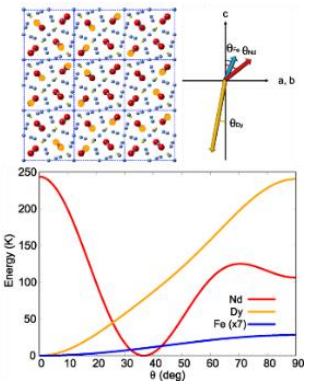
Masamichi NISHINO | Principal Researcher

Statistical mechanics, phase transitions, theory of magnetism, atomistic simulations

We theoretically analyze phase transitions, thermal fluctuations, magnetization reversal, and spin reorientation in magnetic and spin-transition materials.

Using models that incorporate atomic spins and their interactions, we clarify magnetization dynamics and phase-transition mechanisms that are difficult to observe directly in experiments.

By extracting the key interactions governing physical properties from experimental results, we identify the origins of material behavior and provide guidelines for designing new materials.



Yoshihiro TSUJIMOTO | Principal Researcher

Mixed-anion chemistry, new materials synthesis, single-crystal growth, ion conduction, structure–property relationships

By incorporating different anions, including oxygen, nitrogen, sulfur, and halogens, into crystals, we create bonding environments and functionalities that are not available in conventional oxides.

Through the chemical design of crystal structures and anion arrangements, we explore new magnetic, electronic, ion-conducting, and optical properties.

By combining flux growth of single crystals with precise structural analysis and physical-property characterization, we aim to establish design principles for mixed-anion materials.

As an associate professor in the Hokkaido University–NIMS Joint Graduate School Program, he supervises doctoral students.