Materials Growth and Measurement Laboratory

"The services to users are supported by a high-expertise advice and assistance of the scientific and technical MgMl staff."

Offer

- Investigations of crystal structure, magnetic, dielectric, magnetoelectric, electrical- and thermal-transport, thermal and bonding properties of materials in wide ranges of temperature, magnetic and electrical field, and external pressure
- Controlled preparation and detailed characterization of sample for measurements
- Single-crystal growth methods
- Individual experimental methods

Expertise

Material Properties Measurement

Measurements of magnetization, magnetic susceptibility, heat capacity, electrical resistivity, magnetoresistance, Hall resistivity, thermal conductivity, Seebeck effect, thermal expansion, magnetostriction, electrical capacity and permittivity within
wide ranges of temperature (30 mK–1000 K), magnetic field (0–20 T), voltage (–50V–50 V), external pressure (up to 25 GPa)

- Measurements of X-ray powder and single-crystal diffraction at temperatures from 3 to 320 K

Material Growth and Characterization

- Purifying elemental metals (rare earth metals and uranium) and refining single crystals of intermetallic compound
- Synthesis of polycrystalline samples, synthesis of micrograin materials and high temperature crystalline phases metastable at room temperature
- Growth of high quality single crystals using various techniques (Czochralski, Bridgman, floating zone, flux)
- Basic characterization and orientation of single crystals
- Composition analysis of new samples, crystal structure analysis

Research Areas & Excellence

The condensed matter physics and materials research is the major research focus of our Material Growth and Measurement Laboratory (MGML). More specifi cally it is magnetism, magnetocaloric phenomena, multiferroicity, superconductivity, spintronics, and research of Dirac materials.
MGML is holding an official license for onsite manipulation of U and Th metals and compounds for purposes of condensed matter and materials research. This makes MGML one of the few laboratories having a possibility of growth and measurements of novel materials containing these elements.
The main strategic objective of MGML is the excellence of the infrastructure on the international scale. MGML provides the broad scientific community unique possibilities for comprehensive experimental investigation of Condensed Matter Physic and Materials R&D.

- The MGML offers access to:

i) broad range of top-class instrument suite for metals purification, novel materials synthesis and high-quality single-crystal growth finalized by structure and composition characterization
ii) large portfolio of physical characterization techniques focusing on measurements of material properties (thermodynamic, cohesive, magnetic, electrical and thermal transport, spectroscopic, etc.) as a function of a wide range of external
conditions (temperature, magnetic fi eld – up to 19.5 T, electric field, hydrostatic pressure, uniaxial stress)

Key Research Equipment

Material Properties Measurement

- PPMS 14Tand PPMS 9T – Physical Property Measurement Systems

- MPMS XL 7T – Magnetic Property Measurement System
- 20 T and 9 T cryomagnets equipped with 3He/4He dilution refrigerator
- Low-T Diffractometer – Measurements of X-ray powder and single-crystal diffraction

Material Growth and Characterization

- Two Solid State Electrotransport (SSE) instruments
- Arc furnace – synthesis of polycrystalline samples
- Splat cooling system – synthesis of micrograin materials
- Tri-arc furnace, Optical 4-mirror furnace, Multipurpose high frequency induction furnace, Special resistance heating furnace-growth of high quality single crystals
- SETSYS Evolution TGADTA/DSC, SEM Mira 3 – Scanning Electron Microscope equipped by a Bruker EDX detector, BRUKER D8 ADVANCE powder diff ractometer and a Rigaku R-Axis Rapid single crystal diffractometer, Photon Laue diffractometer – composition and crystal structure analysis

"We study magnetism, magnetocaloric phenomena, multiferroicity, superconductivity, spintronics, and research of Dirac materials."

Are you interested in this expertise?

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Experts and their department

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