
Department of Condensed Matter Physics

Offer

- Crystal growth using various techniques (Czochralski, Bridgman, floating zone, flux)
- High-pressure studies of electronic properties of material
- Measurements of magnetic properties at low temperatures and high magnetic fields
- Neutron scattering techniques to study structure and dynamics in solids
- Synthesis and physical properties of hydrides
- X-ray scattering (diffraction in various geometries including grazing incidence, reflectivity, DAFS, EXAFS. etc.)
- X-ray powder diffraction (phase analysis, determination of microstrain, crystallite size, texture and residual stress)
- X-ray scattering theory (kinematical, dynamical)
- Investigation of self-organization during epitaxial growth (experiment and theory)

Expertise

- Study of physical properties of materials using a broad spectrum of techniques as magnetization, heat capacity, electrical resistivity, thermal expansion in a wide temperature range, in high magnetic fields and under high external pressures
- Structural characterization of bulk crystalline samples as well as thin magnetic, ferroelectric and multiferroic layers or nanomaterials
- *Ab initio* theory of electronic structure of solids

Research Areas & Excellence

The Department main mission is the research and education in the field of solid state physics with emphasis on electronic properties of materials. This mission is realized by a broad spectrum of experimental and theoretical research topics with an essential involvement of students and intensive international collaboration, including active participation in European large research infrastructures.

Key Research Equipment

Sample Synthesis Equipment

- SSE (Solid State Electrotransport) for materials Magnetization densities in magnetically ordered material purification
- Tri-arc furnace for single crystal growth using the Czochralski technique
- Optical furnace for single crystal growth
- Induction furnace
- Splat-cooling system for production of amorphous materials
- Hydrogenation equipment
- Vacuum unit and furnaces for flux growth

Structure Analysis

- High-resolution x-ray diffractometer (high temperature chamber up to 800 °C)
- X-ray powder diffractometer (position sensitive detector, high-temperature chamber up to 1600 °C)
- Low-temperature X-ray diffractometer (closed cycle He cryostat)
- X-ray diffractometer with a large twodimensional detector for single-crystal diffraction
- General purpose X-ray diffractometer (Rigaku SmartLab 9kW)
- SAXS X-ray diffractometer (Xeuss 2.0 SAXS/WAXS System)
- Universal static-dynamic deformation and fatigue machine (Instron ElectroPuls E10000)

Physical Properties

- PPMS9, PPMS14, MPMS7XL Quantum Design instruments for various measurements in a wide range of temperatures and magnetic fields, dilution refrigerator (Tmin~30mK) for use in 9T magnet and 3He insert (Tmin~300mK) in 20T magnet
- CCR (Closed-Cycle Cryocooler) for measurements of resistivity, heat capacity and thermal expansion

- Several types of pressure cells for high-pressure measurements up to 15 GPa
- Thermal analysis: DSC, DTA, TGA (SETSYS Evolution TGA-DTA/ DSC SETARAM)

Large Infrastructure Instruments

- ThALES (Three Axis Instrument for Low Energy Spectrometry), installed at ILL Grenoble

Main Projects

- Research Infrastructure – Materials Growth and Measurement Laboratory
- Coordinating the projects related to the participation of the Czech Republic in ILL Grenoble (Research Infrastructure project LM2015050 and INTER-TRANSFER project LTT1701 financed by Ministry of Education, Youth and Sports, Czech Republic)
- Center of spintronics, Project of Excellence No. 14-37427G, Czech Science Foundation, together with Department of Chemical Physics and Optics, the main coordinator is the Institute of Physics, Czech Academy of Science
- NANOCENT – Nanomaterials Centre for Advanced Applications, reg. num. CZ.02.1.01/0.0/0.0/15_003/0000485, Project funded by EU funds call – Excellent Research Teams, implemented together with Department of Physics of Materials
- MATFUN – Physics Martensitic Transformations for the Functionality Enhancement of Crystalline Materials and Nanostructures, reg. num. CZ.02.1.01/0.0/0.0/15_003/0000487
- Project funded by EU funds call – Excellent Research Teams, implemented together with Institute of Physics of Charles University

Academic and Research Partners

Academic Partners

- Institut Laue-Langevin Grenoble
- Technische Universität Wien
- Uppsala University
- Advanced Science Research Center, Japan Atomic Energy Agency, Tokai
- Institute for Transuranium Elements, Karlsruhe
- Physikalisches Institut, Universität zu Köln
- National Institute for Materials Science, Tsukuba
- J. Kepler Universität Linz
- Helmholtzzentrum Dresden-Rossendorf
- Institute Rudjer Bosković, Zagreb
- Technical University of Freiberg
- Institute of Physics, Academy of Sciences of the Czech Republic, Praha
- Institute of High Pressure Physics UNIPRESS (Polish Academy of Sciences)

Industrial Partners

- Vakuum Praha s.r.o., Czech Republic
- Dicont a. s., Czech Republic
- CRYTUR, spol. s. r. o., Czech Republic
- Added Value Industrial Solutions, Eibar, Spain
- Bisson Technology, France

Are you interested in this expertise?

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Experts and their Department

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