

Magnetic Properties Laboratory

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The laboratory is equipped with **SQUID magnetometer MPMS3** made by Quantum Design. The device is designed for the study of magnetic properties of solid and liquid substances, in the range of 1.8 K - 400 K and in magnetic fields 0 - 7 T.

Measuring / Research Options:

- dc and ac measurement
- two measuring techniques using SQUID detection: vibrating magnetometer (VSM) and DC scan
- environmental shield (including earth magnetic field) – measurement in ultralow magnetic fields

Selected specifications and benefits to older MPMS-XL types:

- Rapid sample cooling up to 30 K / min
- Rapid magnetic field change up to 700 Oe / sec
- QuickSwitch magnet - almost instantaneous change of the superconducting magnet from and into the persistent state
- Sensitivity $<1 \times 10^{-8}$ emu for $H < 2500$ Oe

From Promatech funding the **He-3 refrigerator for the SQUID magnetometer MPMS-XL**- was also purchased - expansion of the temperature range to 0.45 K

The Magnetic Properties Laboratory is in close association with the Electron Paramagnetic Resonance Laboratory

The research focus of the EPR Laboratory is to study the effects of magnetism on various types of materials (molecular magnets, low-dimensional magnets, semiconductors and conductors with magnetic impurities, magnetic nanoparticles). For magnetic materials, for example the study of the magnetic anisotropy that stabilizes the orientation of magnetic moments in the space is important in the design of magnetic memories.

Bruker ELEXSYS II E500:

This device operates in a frequency range of 9.4 GHz in magnetic fields up to 1 T. The spectrometer is equipped with a flow-type helium cryostat capable of operating in a temperature range of 300 to 2 K, a programmable goniometer for sample rotation (Figure 2) is available. A special reference sample for qualitative analysis and g-factor calibration is available. It is also possible to perform measurement using the so-called rapid scan of magnetic field and detection of transient phenomena for time-dependent EPR signal detection with a resolution of 8 ns. A high-quality resonator also allows the sample to be irradiated with suitable electromagnetic radiation in the optical region through a built-in optical window, to study photoactive phenomena. The laboratory was built as part of a project Extrem II (Grant No. ITMS 26220120047).

Hg arc light source

Within the Promatech project, the EPR spectrometer was equipped with a wide-band light source (200-2000 nm) using a Hg lamp for sample irradiation when measuring EPR spectra.

