Magnetic Measurements Unit

Introduction

During the last decade, magnetic measurements have become an essential methodology with a wide range of applications in basic and applied research. They are systematically used in Materials' Technology, Inorganic and Bio-inorganic Chemistry, for the magnetostructural study of various samples. Their industrial applications include quality control of metals and alloys, ceramics and molecular complexes.

Facilities & Infrastructure

The Magnetic Measurements Unit of the University of Ioannina is equipped with a Vibrating Sample Magnetometer (VSM), Model 7312 of Lakeshore Cryotronics Inc. (Figure 1). Among the three similar instruments that operate in Greece, this is the only one that can reach measurements up to 1000 K.

Figure 1: The Model 7312 Vibrating Sample Magnetometer of Lakeshore Cryotronics Inc

The technical characteristics of the Vibrating Sample Magnetometer are summarized in the following:

- Magnetic Moment
  Dynamic Region: 5×10^{6} emu to 10^{3} emu
  Time Constants: 0.1, 0.3, 1.0, 3.0 or 10 sec
  Output Stability: Better than ±0.05% for stable temperature and coil geometry in constant field for 24 h
  Reproducibility: Better than ±1%
  Dynamic Field Region: 0.05 kG to 300 kG
  Field Stability: Better than ±0.05%
  Field Accuracy: Better than ±1%
- Electromagnet Model EM7 – HV
- Cryostat – Oven – Temperature Controller
- Temperature range 2 – 300 K and 300 – 1000 K, respectively
- Power Supply Model 665 Bipolar
- Solid and liquid sample holders
- Controlled by user friendly PC software

Services

The equipment above has the ability to collect data of magnetic susceptibility and magnetization in a wide temperature region and a magnetic range between 0 and 2 T. The materials that can be studied are:

- Diamagnetics, paramagnetics, ferromagnetics, antiferromagnetics, ferri-magnetics and anisotropic magnetic materials
- High and low temperature superconducting materials (Figure 2)
- Magnetic materials for recording devices (Figure 3)
- Magneto – optic materials
- Metallorganics and metalloproteins
- Amorphous alloys, glasses and high susceptibility alloys
- Permanent magnets, steels (Figure 4), inks etc.
- Thin films, powders and single crystals

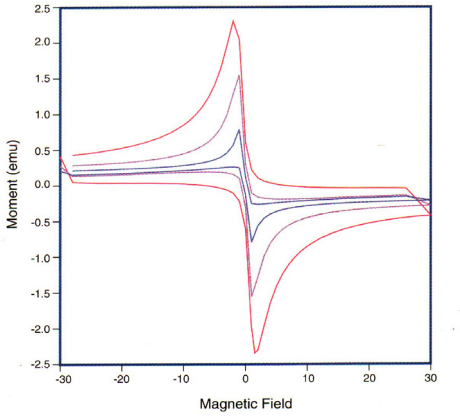

Figure 2: Hysteresis loops from a high temperature semiconductor, at 5, 25 and 50 K.

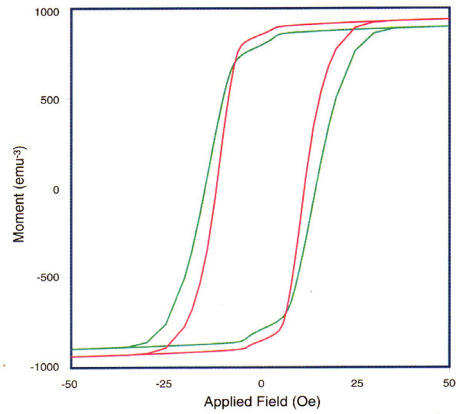

Figure 3: Hysteresis loops from two Nd-Fe-B samples at room temperature.

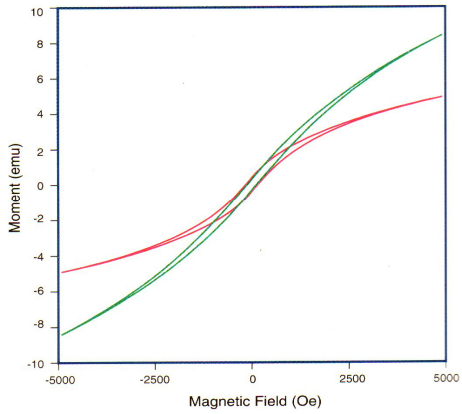

Figure 4: Hysteresis loops for two steels that contain different amounts of chromium.

Staff & Contact Information

A Scientific/Administrative Committee is responsible for the Unit. Information can be obtained by contacting Prof. T. Bakas (tbakas@uoi.gr)

Representative Publications

1. Comparative Mössbauer and Magnetization study of 1%-^{119}Sn doped $La_{0.67}Ca_{0.33}MnO_3$ and $La_{0.67}Sr_{0.33}MnO_3$
   Assaridis E., Panagiotopoulos I., Moukarika A., Bakas T.
   Phys. Rev. ***B75****, 224412-6, (2007)*
2. Magnetic properties of Co films and Co/Pt multilayers deposited on PDMS nanostructures
   Markou A., Beltsios K.G., Panagiotopoulos I., Vlachopoulou M.E., Tserepi A., Alexandrakis V., Bakas T., Dimopoulos T.
   J.M.M.M., **321(17)**, 2582, (2009)
3. Novel Nanohybrids Derived from the Attachment of FePt Nanoparticles on Carbon Nanotubes
   Tsoufis T., Tomou A., Gournis D., Douvalis A.P., Panagiotopoulos I., Kooi B., Georgakilas V., Arfaoui I., Bakas T.
   J. Nanosc- Nanotech., ***8****, 5942, (2008)*