

MPMS Applications

As instruments and systems have become more sensitive and precise, researchers have pursued a vastly broader range of studies into the magnetic properties of materials. Here are just a few examples of the areas in which the accuracy of the MPMS facilitates these efforts.

Physics

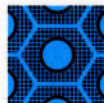


Condensed matter scientists can use the system for low temperature investigations in high magnetic fields. The exceptional dynamic range of the SQUID amplifier allows the MPMS to accommodate samples in many forms, from single crystals to bulk solids and powders. These features, taken together, create a powerful tool for studies of such materials, properties and phenomena as antiferromagnetism, artificially layered structures, biophysics, dichalcogenides, fullerenes, Hall Effect, heavy fermions, high and low temperature superconductivity, hysteresis, Meissner Effect, paramagnetic films, spin glass materials —with more to come as areas of scientific investigations continue to expand.

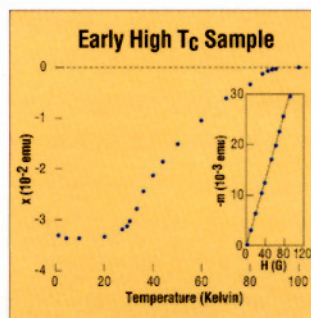
"The MPMS has become an essential tool for scientists studying superconductivity and other high T_c phenomena."



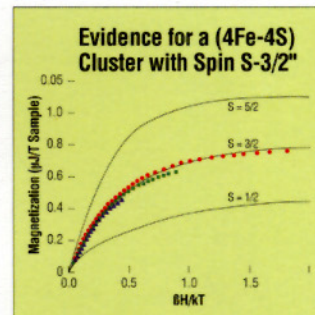
Materials Science



Characterization of the magnetic properties of new materials is central to their evaluation. Not surprisingly, the MPMS is a major tool in the effort to understand and optimize the synthesis process of materials such as amorphous alloys, intermetallic compounds, magneto-optic materials, mesostructures, multi-layered materials, nanocomposite materials, organic materials, rare earth compounds, superconductors, superlattices, thin films, transition metal oxides and weakly magnetic materials. A key advantage is the MPMS's ability to provide ultra-sensitive, repeatable measurements over a wide range of temperatures and applied fields.



Courtesy C.Y. Huang (1988)



P.A. Lindahl, E.P. Day, et al., J. Biological Chemistry 260, 11160 (1985)

"It's also being used for ground-breaking research in condensed matter and materials science."



Chemistry



Magnetochemistry focuses on the inter-relationship between magnetic fields and atomic and molecular structures. In organic chemistry, analysis of magnetic susceptibility, paramagnetic resonance and other properties aids in evaluating the electronic and magnetic properties of chemicals, such as catalysts and highly complex compounds. The MPMS can be used to examine the properties of materials being synthesized, such as magnetic thin films and superlattices, magneto-optic materials, ceramics, and metalloproteins. The broad temperature range of the MPMS, including its ability to work well above and below room temperature, allows researchers to extend their studies into regimes outside the capabilities of other instruments.