Superconductors and Magnetism

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In this investigation, the properties and effects of the magnetic forces, namely flux expulsion, the Meissner effect, and flux pinning, associated with superconductivity are explored and quantified by means of a low-cost apparatus constructed from ordinary DIY supplies. In one of physics' most intriguing phenomena, a permanent magnet can be suspended in a stable levitation above a high-temperature superconductor (HTSC). The magnetic forces involved are here measured quantitatively, several experiments being conducted exploring the relationship between the distance between the magnet and the HTSC and the force exerted. Additional experiments to investigate the result of introducing an external, variable magnetic field to the magnet/HTSC system by means of a solenoid are performed. Results were nowhere in conflict with expectations derived from existing theory. A hypothesis is developed to explain the apparently puzzling results of the extended experiment involving the solenoid, but this awaits additional testing.

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