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MAGNETIC PROPERTIES OF HIGH-T_c SUPERCONDUCTORS: RIGID LEVITATION, FLUX PINNING, THERMAL DEPINNING, AND FLUCTUATION

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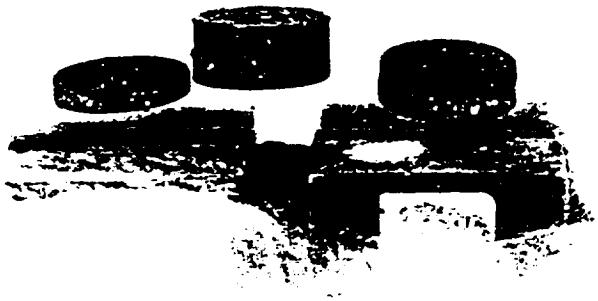
The levitation of high-T_c superconductors is quite conspicuous: Above magnets of low symmetry a disk of these ceramics floats motionless, without vibration or rotation; it has a continuous range of stable positions and orientations as if it were stuck in sand. Some specimens may even be suspended above or below the same magnet.

This fascinating stability, inherent to no other type of levitation, is caused by the pinning of magnetic flux lines by inhomogeneities inside these extreme type-II superconductors.

The talk deals with pinning of magnetic flux in these materials, with flux flow, flux creep, thermally activated depinning, and the thermal fluctuation of the vortex positions in the flux line lattice (often called "flux lattice melting"). Also discussed are the fluctuations of the (nearly periodic) magnetic field inside these superconductors which are caused by random pinning sites and by the finite temperature. These fluctuations broaden the van-Hove singularities observed in the density of the magnetic field by nuclear magnetic resonance and by muon spin rotation.



Disks of $YBa_2Cu_3O_7$ levitating
motionless above a magnet