MAR05-2004-001921

Abstract for an Invited Paper
for the MAR05 Meeting of
the American Physical Society

Octupole moments in f-electron materials

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Multipole moments have recently been recognized as possible order parameters in solids. Unlike dipole moments, they are difficult to be detected experimentally, and may constitute hidden order parameters or fluctuations. By carefully designed experiments using X-ray scattering and magnetization under uniaxial stress, we now have evidence that magnetic octupoles are responsible for the unusual behavior found in certain solids such as $Ce_{0.75}La_{0.25}B_6$ and NpO_2. We clarify the basic idea of multipole physics, and present the current status of research. Ref: K. Kubo and Y. Kuramoto, J. Phys. Soc. Jpn. 72, 1859 (2003); ibid. 73, 216 (2004).

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