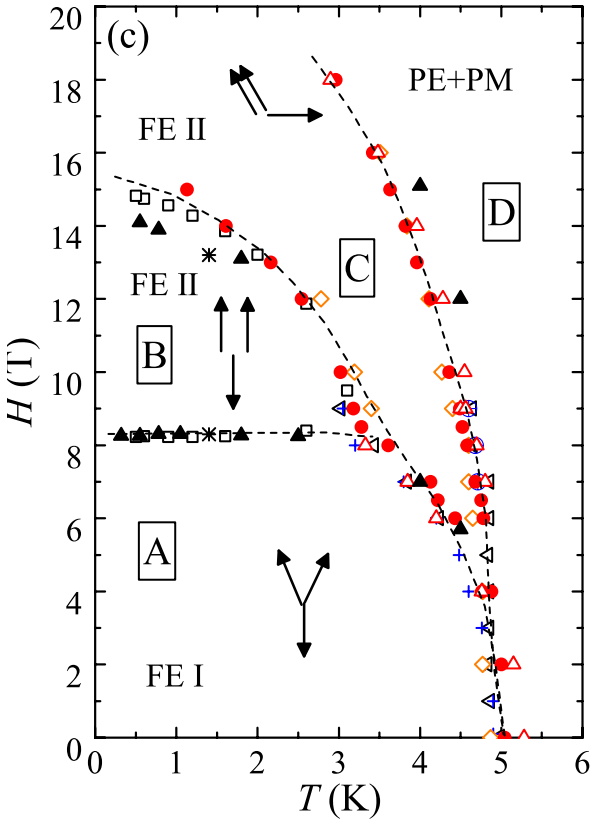
Successive Magnetic Phase Transitions and Multiferroicity in S = 1 Triangular-Lattice Antiferromagnet $Ba_3NiNb_2O_9$



H-T phase diagram for $Ba_3NiNb_2O_9$. The arrows indicate spin structures. PM:paarmagnetic; PE: paraelectric; FE: ferroelectric.

Scientific Achievement

The studies on $Ba_3NiNb_2O_9$ reveal that (i) it is a new S = 1TLAF system showing two magnetic phase transitions bracketing an intermediate up-up-down phase; (ii) it is a multiferroic system with ferroelectric ground states stabilized at all three magnetic phases.

Significance and Impact

$Ba_3NiNb_2O_9$ is a rare system showing multiferrocicity with a small spin (S = 1). The possibility of strong couplings between the quantum spin fluctuations and ferroelectricity provides a new mechanism for multiferroicity.

Research Details

The magnetic ground state of $Ba_3NiNb_2O_9$ was determined by neutron powder diffraction. The Phase diagram was determined by DC and AC magnetic susceptibility, dielectric and polarization measurements.

Neutron powder diffraction was measured at the High Resolution Neutron Powder diffractometer HB2A at the High Flux Isotope Reactor, ORNL.

J. Hwang, E. S. Choi, F. Ye, C. R. Dela Cruz, Y. Xin, H. D. Zhou, and P. Schlottmann, Phys. Rev. Lett. **2012**, 109, 257205

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