Canadian Association of Physicists Association canadienne des physiciens et physiciennes

Contribution ID: **1644** Type: **CLOSED - Oral (Student, In Competition) / Orale (Étudiant(e), inscrit à la compétition)**

Magnetic phase transitions and magnetoelastic coupling in $Ba_3CoSb_2O_9$

Tuesday 30 May 2017 14:30 (15 minutes)

In a variety of frustrated triangular lattice antiferromagnets with easy-plane anisotropy, it has been shown that a magnetization plateau is produced at $1/3$ of the saturation value for a magnetic field parallel to the basal plane.
This magnetization plateau is associated with a collinear up-up-down state where two spins are parallel to the field while the third one is antiparallel.
So far, this plateau has been shown to be accounted for by quantum and thermal fluctuations.
With perfect triangular lattices, weak interlayer interaction, and an effective $1/2$ spin, $Ba_3CoSb_2O_9$ is probably the best prototype of a frustrated quantum system.
We determined the H-T phase diagrams of $Ba_3CoSb_2O_9$ for magnetic fields applied parallel and perpendicular to the basal plane using sound velocity measurements.
As the Landau model approach fails to explain all experimental observations, we studied the field dependence of magnetization at T = 0 using a classical model which considers the effect of the bi-quadratic ($\sim S^4$) coupling term.
Such interaction has been shown to arise from fluctuations or the coupling between spins and elastic degrees of freedom.
Taking into account the intralayer and interlayer interaction, the easy plane anisotropy and the bi-quadratic coupling, the model numerical results agree very well with the phase sequences observed for $\mathbf{H} \parallel a$ and $\mathbf{H} \parallel c$.
Moreover, in order to determine the magnitude of bi-quadratic coupling, we also estimated the magnetoelastic coupling strength by measuring the relative ultrasound velocity variation as a function of the field orientation at constant temperatures and field values.

Author: Mr LI, Ming (Memorial University of Newfoundland)

Co-authors: Prof. QUIRION, Guy (Memorial University of Newfoundland); Prof. PLUMER, Martin (Memorial University of Newfoundland); Prof. QUILLIAM, Jeffrey (Université de Sherbrooke); Prof. ZHOU, Haidong (University of Tennessee); Mr DUN, Zhiling (University of Tennessee)

Presenter: Mr LI, Ming (Memorial University of Newfoundland)

Session Classification: T3-1 Geometrically Frustrated Materials (DCMMP) | Matériaux géométriquement frustrés (DPMCM)

Track Classification: Condensed Matter and Materials Physics / Physique de la matière condensée et matériaux (DCMMP-DPMCM)