MAR08-2008-020493

Abstract for an Invited Paper
for the MAR08 Meeting of
the American Physical Society

Neutron Scattering from Magnetically Frustrated Ruthenium Pyrochlores

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Spin-1 ruthenium pyrochlores feature strong exchange interactions and deeply suppressed Néel ordering. In addition a doping induced metallic phase has been demonstrated. I discuss neutron scattering experiments that explore the strongly frustrated quantum magnetism of $Y_2Ru_2O_7$ [1] and $Pr_{2-x}Bi_xRu_2O_7$ [2]. In $Y_2Ru_2O_7$ (Θ_{CW}= –1100 K, T_N=77 K) much of the magnetic spectral weight is concentrated in a 20 meV spectral peak above an 11 meV low temperature gap in the excitation spectrum. In $Pr_{2-x}Bi_xRu_2O_7$ magnetic order which occurs for $T<T_N$=160 K when x=0, is suppressed when the material becomes a metal for $x \approx 1$. I discuss the anomalous low energy spin dynamics associated with praseodymium for x=0 and x=1 and relate the results to other rare-earth pyrochlores.

[1] J. van Duijn, N. Hur, J. W. Taylor, Y. Qiu, Q. Z. Huang, S.-W. Cheong, C. Broholm, and T. G. Perring, Submitted to Phys. Rev. B Rapid Communications, cond-mat 0707.2678v1 (2007).
[2] J. van Duijn, K. H. Kim, N. Hur, D. Adroja, M. A. Adams, Q. Z. Huang, M. Jaime, S.-W. Cheong, C. Broholm, and T. G. Perring, Phys. Rev. Lett. **94**, 177201 (2005).