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Antiferromagnetism and bulk spin valve effect in $Ca_3(Ru_{1-x}Ti_x)_2O_7$ J. PENG, T.J. LIU, Z. QU, E. VEHSTEDT, B. QIAN, D. FOBES, Tulane University, L. SPINU, University of New Orleans, W. BAO, Los Alamos National Laboratory, Z.Q. MAO, Tulane University — $Ca_3Ru_2O_7$ has generated growing interest. It shows an antiferromagnetic (AFM) transition at $T_N = 56$ K, followed by a metal-insulator (MI) transition at $T_{MI} = 48$ K [1]. Giant magnetoresistance (GMR) across its metamagnetic transition is also observed. We have determined the magnetic structures of $Ca_3Ru_2O_7$ under magnetic fields using neutron scattering [2]. Our results demonstrate that the GMR in this material originates from a bulk spin-valve effect, and clarify the origin for the puzzling observation that the GMR occurs under easy axis field alignment, while a colossal magnetoresistance appears with hard axis field alignment [1]. In addition, we have studied the effect of Ti doping on $Ca_3Ru_2O_7$. We find that Ti doping dramatically affects both the AFM and the MI transition by shifting them to much higher temperatures, e.g. $T_N = 114$ K and $T_{MI} = 107$ K for 10% Ti doping. We will discuss possible origins for this remarkable doping effect. This work is supported by the NSF under grant DMR-0645305, the DOE under DE-FG02-07ER46358.

[1] G.Cao *et al.*, Phys. Rev. Lett. **78**, 1751 (1997)
[2] Wei Bao *et al.*, Phys. Rev. Lett. **100**, 247203 (2008)

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