Abstract Submitted
for the MAR07 Meeting of
The American Physical Society

Substitution effects in the spin-gap compound $BiCu_2PO_6$[1] A.V. MAHAJAN, B. KOTESWARA RAO, Dept. of Physics, IIT Bombay, J. BOBROFF, Labo. de Physique des Solides, Orsay, France — $BiCu_2PO_6$ has a structure where the Cu spins appear to form a two-leg ladder. From our susceptibility measurements, we indeed find an exponential decrease of the spin-susceptibility (χ_{spin}(T)) below a broad maximum with a spin-gap (Δ) of about 40 K. Analysis of χ_{spin}(T) indicates that the leg and rung exchange couplings are nearly equal and further that the inter-ladder coupling is not negligible. No long-range order was observed down to 1.8 K. Heat capacity measurements yield $\Delta \approx 40$ K. Isovalent substitutions (Zn and Ni) at the Cu site destroy the spin-gap and induce a transition to a spin-glass/disordered magnetic state below about 5 K, as seen from our susceptibility, heat capacity, and μSR data. Heterovalent substitutions (Pb, Sr) at the Bi site, which should release one hole per substituent, do not significantly change the magnetic behavior other than a low-T Curie term in the susceptibility. On the other hand, Na doping (which should give rise to two holes per Na) gives rise to an additional peak in χ_{spin}(T) at about 20 K, below the broad maximum at 60 K. The nature of this transition is currently being investigated.

[1]Funding from the Indo-French Center for Promotion of Advanced Research is acknowledged

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Date submitted: 14 Nov 2006 Electronic form version 1.4