



Contribution ID: 46

Type: ORAL CONTRIBUTION

Magnetism in Azurite Studied by Muon Spin Rotation

Tuesday, September 14, 2010 2:40 PM (20 minutes)

The natural mineral azurite $\text{Cu}_3(\text{CO}_3)_2(\text{OH})_2$ represents a new type of low-dimensional frustrated quantum spin system with a diamond spin chain as basis. From specific heat [1] there is evidence for a phase transition at ca. 1.8 K which however is magnetically still ill-defined. Earlier muon spin rotation experiments [2] have indicated a magnetic transition yet no systematic study has been reported. We have performed zero field and transverse field muon spin rotation experiments at Paul Scherrer Institut Villigen (Switzerland) in the temperature range from 0.02 K to 6 K on polycrystalline powder and a single crystal. We could corroborate the appearance of magnetic order below 1.9 K from spontaneous muon spin rotations with frequencies following a magnetization curve indicating 2-dimensional correlations. There is evidence for a further change in magnetic structure below about 500 mK. The ordered magnetic Cu moments can be estimated to be only on the order of some tenths of a Bohr magneton in agreement with recent neutron scattering data [3].

References

- [1] H. Kikuchi, et al., Phys. Rev. Lett. 94, 227201(2005).
- [2] H. Kikuchi, et al., Progress of Theoretical Physics Supplement. 159, 1 (2005)
- [3] K. Rule, et al., Phys. Rev. B 81 in print (2010)

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Session Classification: MAGNETISM AND MAGNETIC MATERIALS: BULK AND THIN FILMS

Track Classification: Magnetism and Magnetic materials - Bulk and thin layers