Synthesis, Structure and Magnetic Properties of $Pb_2VO(PO_4)_2$: The second example for a frustrated S=1/2 square lattice Antiferromagnet

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9.7 cm

Among low dimensional spin systems, frustrated S=1/2 square lattice systems have attracted strong theoretical interest, since an interesting phase diagram and unusual ground states are expected depending on the strength of the diagonal frustrating exchange J_2. However, experimental studies were very limited since the only compound where such spin system is realized ($Li_2VOA^{+4}O_4$ (A=Si, Ge)) was discovered only 2 years ago. We have discovered a new compound, $Pb_2VO(PO_4)_2$ where the structural data as well as susceptibility and specific heat measurements suggest that such a frustrated S=1/2 lattice is also realized. $Pb_2VO(PO_4)_2$ has a structure formed by layers composed by S=1/2 V^{+4} in pyramidal coordination connected by PO_4 tetrahedra similar to that found in $Li_2VOA^{+4}O_4$ (A=Si, Ge) but modulated along b. These layers are well separated by layers of Pb atoms and isolated PO_4 tetrahedra. Magnetic Susceptibility measurements shows a clear maximum at $T_{Max} \approx 8.7$ K with a decrease towards lower temperatures. At T $\approx$ 3.6K we observe a very weak magnetic transition which becomes very pronounced and shifts to higher temperatures with applied magnetic field. This suggest that $Pb_2VO(PO_4)_2$ is very close to a quantum critical point.

13.4 cm

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