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Orbital ordering in CaV_2O_4: A neutron scattering study OLIVER PIEPER, Helmholtz Zentrum Berlin (HZB), B. LAKE, A. DAOUD-ALADINE, M. REEHUIS, T. PERRING, M. ENDERLE, K. RULE, K. PROKES, B. KLEMKE, K. KIEFER, A. NIAZI, J.Q. YAN, D.C. JOHNSTON, A. HONECKER — CaV_2O_4 is a quasi-one dimensional spin-1 Heisenberg antiferromagnet. The magnetism arises from the partially filled t_{2g}-levels of the V^{3+}-ions, which in addition give an orbital degree of freedom to the system. In contrast to the isovalent vanadium spinel compounds, the low dimensionality in CaV_2O_4already arises from the crystal structure. It contains weakly coupled double-chains of edge-sharing VO_6 octahedra, where the particular octahedral staggering creates a zigzag-like arrangement of the vanadium ions. This in return gives rise to strong magnetic direct exchange interactions between nearest and next nearest neighbor vanadium ions and to geometrical frustration. However, the strength of the exchange interactions is strongly influenced by the particular occupation of the t_{2g}-orbitals. Depending on the type and degree of octahedral distortion, the system can be interpreted as a frustrated Haldane chain or a spin-1 ladder. Here we use single crystal neutron diffraction and neutron spectroscopy to determine the spin structure as well as the complex excitation spectrum of CaV_2O_4. The results are analyzed theoretically and from this the leading exchange paths are deduced and discussed in terms of orbital ordering.

Oliver Pieper
Helmholtz Zentrum Berlin (HZB)

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