

Poster session C

Magnetic anisotropy of unconventional magnetic phases in the frustrated zigzag spin-1/2 chain system β -TeVO₄

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Zigzag spin-1/2 chain system β -TeVO₄ belongs to an interesting class of one-dimensional quantum magnets where both low dimensionality and frustration enhance the effects of quantum fluctuations and weak interactions introduce long range magnetic order at low temperatures. Strong frustration can lead to vector chiral (VC) ordered state which gained attention through its connection to certain type of multiferroics [1] and in frustrated spin-1/2 chain systems due to the presence of spin multipolar phases in high magnetic fields [2].

In β -TeVO₄ spin-1/2 zigzag chains are formed by distorted VO₅ pyramids sharing their corners (Fig. 1). Magnetic susceptibility measurements revealed three magnetic phase transitions at T₁= 2.26, T₂=3.28 and T₃=4.65K [3] and theoretical study showed that nearest-neighbour interactions are ferromagnetic, while next-nearest-neighbour interactions are antiferromagnetic [4], supporting strong frustration in this system. Recently, these phases were characterized in a comprehensive study of high-field magnetization, specific heat and neutron diffraction measurements as a VC phase (T<T₁), a new stripe phase (T₁<T<T₂) and a spin-density-wave (SDW) phase (T₂<T<T₃) [5].

We present results of magnetic torque measurements which probe bulk magnetic anisotropy. Measurements were performed in the paramagnetic and magnetically ordered phases. We determine temperature dependence of magnetic susceptibility along the principal magnetic axes which are different than crystal axes and rotate with temperature (Fig. 2). Symmetry is lowered already below T₃ in the SDW phase. Each phase can be distinguished by a different temperature behaviour of bulk magnetic anisotropy and rotation of magnetic axes which stops below T₁ in the VC phase. Unlike neutron diffraction measurements, torque magnetometry probes both ordered and disordered contributions. Prompted by a possibility of the appearance of multiferroicity in the VC phase we have recently started dielectric spectroscopy measurements which will also be presented here.

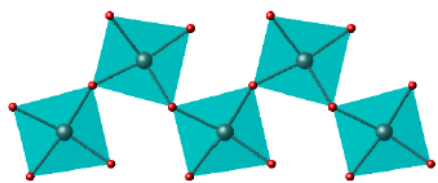


Fig. 1. Zigzag spin chain in β -TeVO₄.

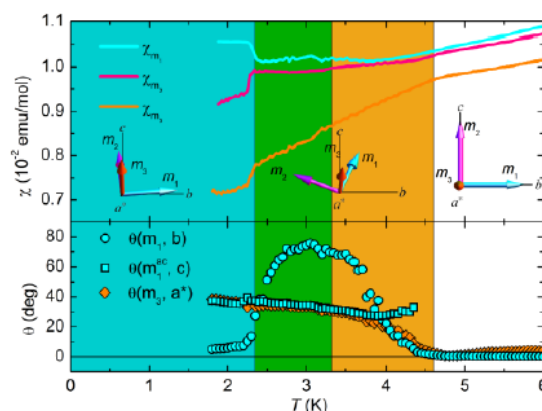


Fig. 2 Magnetic susceptibility along principal magnetic axes which rotate with temperature.



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