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Unexpected Phase Transitions in AMO4 scheelites.

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The vast majority of solid state oxides contain transition metals in an octahedral, or a distorted variant thereof, environment and the interconnectivity and distortions of the MO6 units drive their interesting and occasionally technologically important physical properties. Oxides where the transition metal has a tetrahedral geometry are less well studied. The Scheelite structure is one such example and this presentation will describe some of our recent studies on two classes of scheelites; the 3:5 oxides Ln3+Nb5+O4 and the 1:7 oxides A1+M7+O4 (A = Ka, Rb, Cs, Tl; M = Tc, Ru, Re and Os).

The synthesis, structures and magnetic properties of the Ru and Os salts AMO4 (A = K, Rb and Os) are described. Both K salts adopt the ideal tetragonal Scheelite structure and contain isolated MO4 tetrahedra. Both show AFM ordering along [001] described by k = 000 at low temperature and neutron diffraction measurements reveal a reduced moment ~ 0.5 μβ due to a combination of covalency and spin-orbit coupling. RbOsO4 displays the same tetragonal structure and is an antiferromagnet with TN ~ 20K. RbOsO4 has an orthorhombic structure in Pnma as a consequence of rotations of the OsO4 and this transforms to the tetragonal structure upon heating above 400 K; both Rb salts are AFM. At room temperature the two Cs salts are both orthorhombic and both undergo additional transitions upon cooling.

Temperature dependent structural studies of ATcO4 (A = Ag, Tl, Rb and Cs) from 90K to their melting points reveal unexpected phase transitions in RbTcO4 that displays a I41/a to I41/amd transition and in TlTcO4 where the orthorhombic (Pnma) to tetragonal (I41/a) transformation proceeds via an intermediate orthorhombic phase. Like the Ru and Os oxides CsTcO4 undergoes a first order orthorhombic (Pnma) to tetragonal (I41/a) transition upon heating.

Speakers Gender

Male

Travel Funding

No

Level of Expertise

Experienced Researcher

Do yo wish to take part in the poster slam

No

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