



EXPERIMENTAL REPORT

Experiment Title

Structural and magnetic phase transitions of potassium-holmium double tungstates

Proposal N° PHY-01-1441

Instrument E4

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The alkali-dysprosium double tungstates $ARe(WO_4)_2$ ($AReW$), where A is alkali ion, $Re=Dy, Er, Ho, Nd$, belong to the class of magneto-elastic with interrelation between magnetic and elastic ordering. Scientific interest is connected with structural and magnetic phase transitions observed for them. For $KHoW$ the spontaneous structural phase transition (SPT) of the cooperative Jahn-Teller effect (CJTE) type was observed at 5.6K in several experiments. The problem of the magnetic phase transition (MPT) for $KHoW$ was still open. In specific heat (including specific heat in magnetic field) and susceptibility experiments without doubt the induced magnetic phase transition was found at 0.4K for $H=1T$ and 0.33K for $H=0.1T$.

The neutron scattering experiment, in the frame of this project was directed to solve the problem of existence and conditions of the spontaneous/induced MPT for $KHoW$ single crystal and to determine the structure of the magnetic state for it, if it exists. Our earlier neutronographic results obtained for $KHoW$ were only clear for magnetic field 1T at $T=0.05K$: some small additional magnetic peaks were observed. The peaks were small and wide but on the correct positions.

For neutron scattering experiments on oriented single crystal the set of selected temperatures, magnetic fields and directions was following: $T= 40, 60, 104, 213, 317, 435, 533, 622, 718, 807, 890mK, 1.7K, 10K$; $H= 0-2.0T$ with step 0.1T, directions 001, 200, 002, -202, 201, 20-1, -204, 400, -404, 40-1, 40-2, 60-2, 60-4. The choice of above temperature and magnetic field values is connected with our earlier experimental results of specific heat, susceptibility experiments and earlier neutronographic experiments on powdered and single crystals on E2 instrument.

The results obtained for oriented $KHoW$ single crystal for wavelength 2.4Å on instrument E4 do not confirm of existence of spontaneous magnetic phase transitions (up to 40mK). The

existence of induced magnetic phase transitions is confirmed (at temperature below $T=0.4K$). In this last case some properties indicate the ferromagnetic ordering (especially for higher magnetic fields). The Figures present the temperature and magnetic dependences for some choosed directions. It must be underlined that existence of reflex on 001 direction is not clear for $C2c$ symmetry.

