ESR Study of Mn-Heterovalent Ludwigite $Mn_{3-x}Cu_xBO_5$

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$Cu_{1.8}Mn_{1.2}BO_5$ and $Cu_{2.5}Mn_{0.5}BO_5$ single crystals were synthesized by the flux method. The grown single crystals have the form of orthogonal prisms with a length of 10 mm and a transverse size of about 2 mm. The sample belongs to

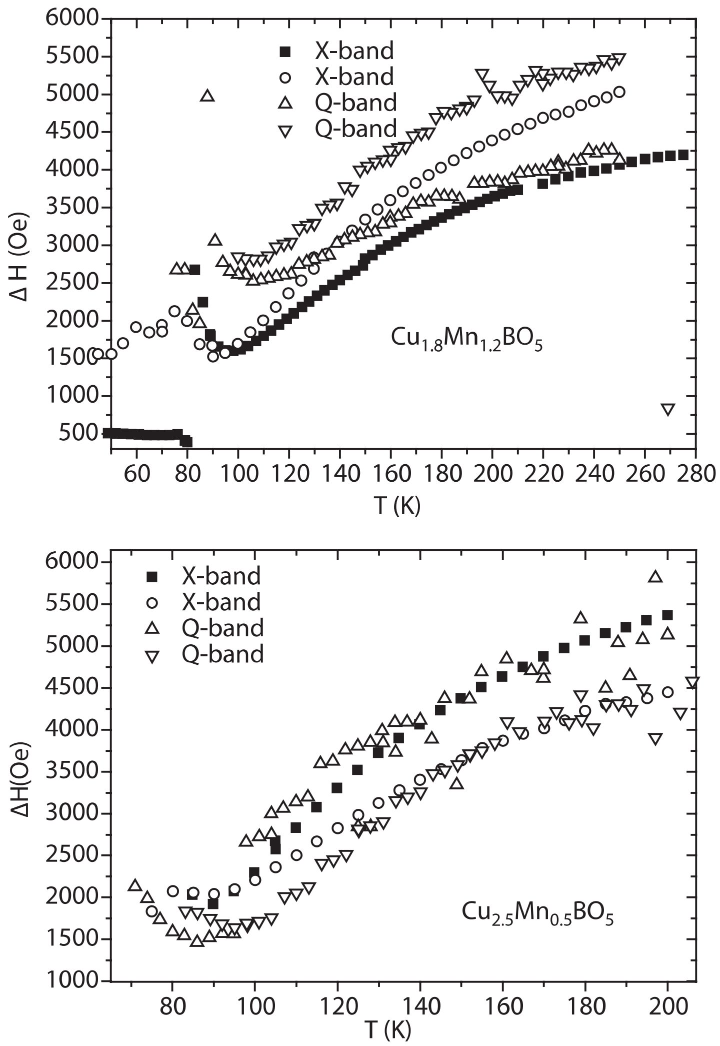

Fig. 1. Temperature dependence of ESR linewidth in X- and Q-band in two directions of magnetic fields for x = 1.8 and x = 2.5.

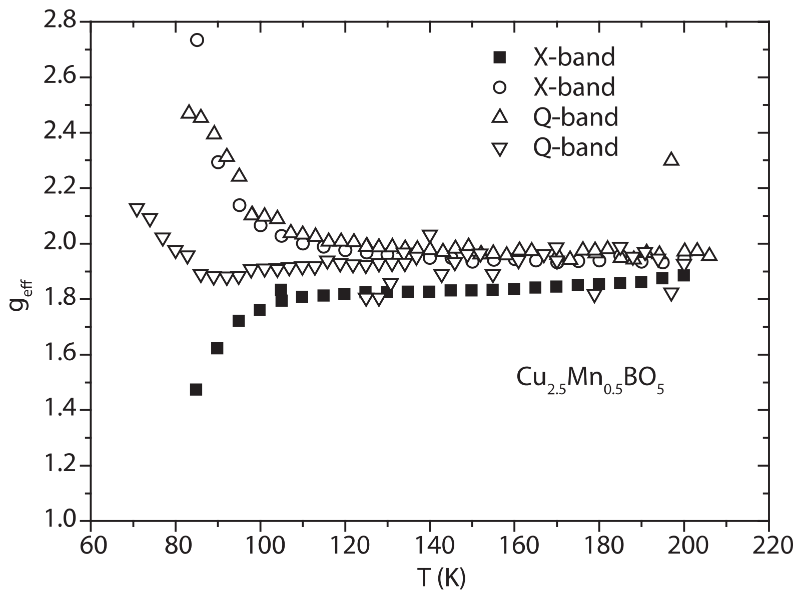

Fig. 2. Temperature dependence of effective *g*-factor in X- and Q-band in two directions of magnetic fields for $x = 1.8$ and $x = 2.5$.

the space group $P2_{1/c}$. In the 75 K region, a feature in the magnetic susceptibility behavior is observed in both ZFC and FC regimes, which can be related to different temperature dependence of magnetization of different sublattices Mn and Cu.

ESR measurements were carried out in the paramagnetic regime at the temperature above the phase transition temperature $T \sim 90$ K at the 9.48 GHz (X-band) and 34 GHz (Q-band) and two different orientation. In this temperature range the ESR spectrum of $Cu_{1.8}Mn_{1.2}BO_5$ and $Cu_{2.5}Mn_{0.5}BO_5$ consists of one broad exchange-narrowed resonance line. Near the phase transition the ESR linewidth exhibits its minimum value of about 1500 Oe in X-band and 2500 Oe in Q-band for $Cu_{1.8}Mn_{1.2}BO_5$ and about 2000 Oe in X-band and 1500 Oe in Q-band for $Cu_{2.5}Mn_{0.5}BO_5$ (Fig. 1).

In addition, for $x = 1.8$ the linewidth shows a pronounced anisotropy which depended from frequency band and temperature, while for $x = 2.5$ anisotropy of linewidth almost independent on frequency band and temperature.

A strong dependence of the effective *g*-factors on the orientation at a temperature below the phase transition was observed for both samples (Fig. 2). From the ESR measurements at the 9.48 GHz (X-band) and 34 GHz (Q-band) can be assumed that the anisotropy caused by complex magnetic structure of crystals and is suppressed by the external magnetic field.

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