ULTRASONIC ATTENUATION BY THE JAHN-TELLER CENTERS IN ZnSe:Cr IN STRONG LONGITUDINAL MAGNETIC FIELD

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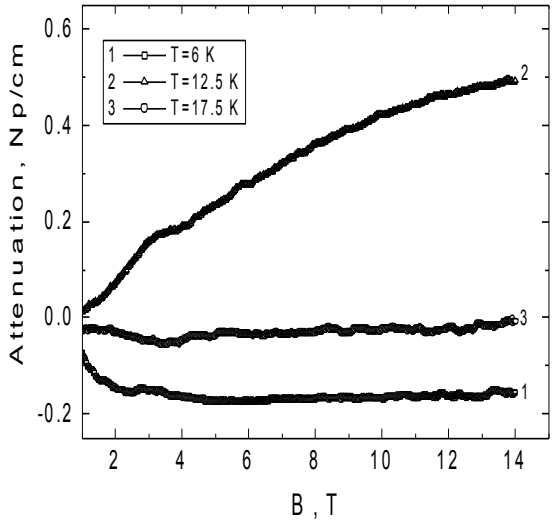
In our former investigations [1], we have found the peak of ultrasonic attenuation $\alpha(T)$ in $ZnSe:Cr^{2+}$ crystal. We have interpreted it as due to relaxation in the system of Jahn-Teller centers Cr4Se. Later, we have carried on experiments in longitudinal field (wave vector **k** parallel to magnetic field **B)** [2]. The experiments have revealed resonant-like dependence $\alpha(B)$ at considerably low magnetic fields. Here we report the results of our recent measurements in strong fields at a number of fixed temperatures: 1.4, 2, 4.2, 6, 8, 9, 10, 12.5, 15, 17.5, 20 K. Two specimens were studied with concentration of the impurities 3.8×10^{18} cm^{-3} and 5×10^{19} cm^{-3}. We have observed a monotonous increase of attenuation which was proportional to the magnitude of relaxation attenuation at given temperature. In the figure, one can see the most typical dependences obtained at 29.5 MHz for the slow shear mode propagating along the <110> crystallographic axis. Peak of relaxation attenuation at this frequency is observed at 11.7 K, so, the most pronounced magnetic field variation of attenuation is seen at 12.5 K (if to discuss the measured row of temperatures). Theoretical consideration of the Jahn-Teller effect and spin-orbit Hamiltonian for the impurity complex shows that sixfold degenerate (with spin states) ground state at B=0 splits in strong magnetic field and the lowest energy states represent 2 degenerate levels. Calculation shows that variation in population distribution of the centers among these levels should lead to increase of attenuation by the factor of 1/3 that is in good agreement with the experimental data.



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