OPTICAL PROPERTIES of $TlGaSe_2$ CRYSTALS

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$TaGaSe_2$ semiconductors crystallize as a layered structure and have monoclinic lattice [1]. One of the features of these crystals is a strong anisotropy of physical characteristics due to the specificity of the crystal structure [2]. The influence of temperature and pressure on the optical spectra near the absorption edge in $TlGaS_2$ crystals were studied [3]. It was investigated the Raman scattering at different geometries and temperatures (from 77 to 400 K) [3].

The indirect transitions in excitonic bands C_1 and C_2 with phonon emission and direct transitions of excitonic series A, B, C and D were observed in absorption spectra of $TlGaSe_2$ crystals. The ground and excited states of excitons were discovered in wavelength modulated transmission spectra for E||a and E||b polarizations. The main parameters of excitons and bands for all excitonic series as binding energy of ecxitons, reduced effective mass, masses of electrons and holes were determined.

The resonance Raman scattering in Y(YX)Z and Y(ZX)Z geometries excited by He-Ne laser was investigated at temperature 10 K. The energies of phonons with A_g and B_g symmetries were determined. It was shown, that amount of modes in Raman scattering and IR reflection spectra measured at 10 K are half as great than expected according the group theory calculations. The experimental and theoretical results coincide if the crystal describe by symmetry group D_{2h}. The superposition of excitonic luminescence with resonance Raman scattering emission was observed. The lines of resonance Raman emission was identified and attributed to optical phonons in Brilloin zone center.

References:

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