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Large oscillator strength excitons in $PbGa_2S_4$ crystals

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Abstract

Exciton states with a large oscillator strength (transverse–longitudinal splitting of 50meV) and binding energy of 290meV have been observed in PbGa2S4 crystals. The ground exciton states are stable up to the room temperature. The ground (n=1) exciton state and two excited (n=2 and n=3) states of the short-wavelength B-excitons series were observed at low temperature (T=10K). The ground (n=1) and the excited (n=2) states of the long-wavelength A-exciton series were also revealed. The exciton Bohr radius of the ground exciton state was determined to be 70Å for the A-exciton and 10Å for the B-exciton. The band splitting and the main parameters of excitons have been determined from the calculation of the reflectivity spectra contours. The group theory analysis of the band symmetry was performed and the scheme of bands responsible for exciton transitions in the center of the Brillouin zone was proposed.