EXCITONIC STATES IN LAYERED SEMICONDUCTOR SINGLECRYSTALS

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Since the discovery of graphene in 2004, monatomic and multi-atom thick materials have attracted increasing attention due to their excellent mechanical and electronic properties [1]. The absence of dangling bonds over large specific areas ensures low charge dissipation in graphene and other two-dimensional (2D) non-graphene materials, making them suitable for applications in high-speed electronics, optoelectronics, sensing, and energy generation and storage. However, the use of graphene in electronics is limited due to its zero bandgap. In this regard, graphene alternatives that have a similar two-dimensional structure, but with their own band gap, have been intensively studied in recent years. Among these materials are transition metal chalcogenides such as SnSe, and GaSe. And, the optical properties of these materials, in particular excitonic states, and the influence of the layered structure of the material on them are also of interest.

Optical properties of GaSe single crystals were investigated by measuring of reflection, transmission and photoluminescence spectra in wide temperature diapason 10 – 300 K. The parameters of three excitonic series for C_1-V_1, C_2-V_1 and C_3-V_1 bands were determined [2].

Layered SnSe demonstrate presence of A, B, C and D excitonic series in the minimum of interband interval. By analysis of low temperature reflection spectra of the excitons parameters (Rydberg constant, tramnslaiton and reduced effective masses) were determined. The effective masses of electrons and holes forming these excitons were also determined [3].

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References

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