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# Exciton and trion photoluminescence properties in 2D molybdenum disulfide

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Nanolayers of transition metal dichalcogenides are interesting as 2D materials for novel nano-optoelectronics. Molybdenum disulfide is one of the most studied. At the limit of the monolayer, whose thickness is ˜0.7 nm, molybdenum disulfide possesses a direct optical bandgap leading to an intense excitonic photoluminescence (PL) and a bandgap value of about 1.88 eV (660 nm) at room temperature. Its emission spectrum consists of the A and B exciton peaks. The A peak is dominant and, in turn, contains two components related to a neutral exciton and a negative trion. The optical properties of the exciton and trion are dependent of external conditions, i.e., temperature and strain, or various laser excitation conditions, i.e., energy and power. At the same time, the exciton emission is highly dependent on the number of layers: PL redshifts and quenches with increasing thickness. Moreover, the trion properties are highly dependent on these conditions because its binding energy is much less than that of the exciton. The trion spectral weight and dissociation energy are observed to increase with the number of layers, being correlated with an increase in nonequilibrium electron density. A faster intensification of the trion component compared to the A exciton occurs with increasing temperature and excitation power. Also, the intense exciton/trion PL band redshifts and becomes more asymmetric when increasing excitation power. Under strain, the PL undergoes the strain-related blueshift accompanied by a weakening of the contribution of the trion to the spectrum and the trion binding energy.

## Type of presence

Presence online

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