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Temperature dependence of 2D MoS2 photoconductivity.

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Photoelectric properties of a two monolayer thick (indirect-gap) MoS2 flake with lateral Ag contacts on a SiO2/Si substrate were studied. Photocurrent spectra were obtained with AC technique using a lock-amplifier at temperatures from 10 to 290 K. Apart from a band due to Si substrate, a contribution of MoS2 reveals in the spectra as a broad background of band-to-band transitions and sharp peaks of A and B excitons originating from a spin-orbital split of the valence band. An increase of the exciton contribution with temperature is observed, being followed by a decrease above 110 K. Above 200 K, the exciton peaks transfer to valleys on the background originated from band-to-band transitions. The temperature increase of integral A and B exciton photoresponse with temperature is analyzed in terms of thermal dissociation of the excitons. The exciton binding energy of 680 meV was estimated from the exponential part of temperature dependency.

Topics

Session A. Physics of condensed matter and spectroscopy

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