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Controlling Excitons Complexes in Two Dimensional MoS_2 Monolayers

Authors : Arslan Usman, Abdul Sattar, Hamid Latif, Afshan Ashfaq, Muhammad Rafique, Martin Koch

Abstract : Two-dimensional materials have promising applications in optoelectronic and photonics; MoS_2 is the pioneer 2D material in the family of transition metal dichalcogenides. Its optical, optoelectronic, and structural properties are of practical importance along with its exciton dynamics. Exciton, along with exciton complexes, plays a vital role in realizing quantum devices. MoS_2 monolayers were synthesized using chemical vapour deposition (CVD) technique on SiO_2 and hBN substrates. Photoluminescence spectroscopy (PL) was used to identify the monolayer, which also reflects the substrate based peak broadening due to screening effects. In-plane and out of plane characteristic vibrational modes $E^1{}_2g$ and A_1g, respectively, were detected in a different configuration on the substrate. The B-excitons and trions showed a dominant feature at low temperatures due to electron-phonon coupling effects, whereas their energies are separated by 100 meV.

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