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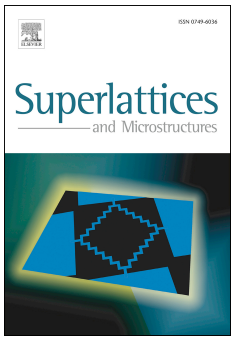


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# Exciton binding energies in CdSe/MgSe quantum well structures

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**Abstract**

Binding energies of heavy- and light-hole excitons in CdSe/MgSe quantum wells have been determined in terms of quantum well width. Hydrogenic wave functions are assumed to represent exciton wave functions. Contribution of the polarization charges originating from the dielectric mismatch between the well and the barrier materials to the Coulomb interaction is calculated by means of image charge method. The effect of the exciton-phonon interaction on the exciton binding energies are included by means of an effective potential obtained through an exciton-bulk-optical-phonon Hamiltonian. The results indicate that both the modified Coulomb interaction due to the dielectric mismatch and the exciton-phonon interaction considerably change the exciton binding energy. The heavy-hole exciton binding energy in a 10-Å quantum well is seen to be enhanced as much as 87% compared to the value found when only the Coulomb interaction without dielectric mismatch is taken into account. The resulting binding energies of heavy-hole excitons range approximately between 57 and 41 meV for the quantum well width changing between 10 and 35 Å. Compared to the bulk CdSe exciton binding energy 15 meV, the exciton binding energies in CdSe/MgSe quantum wells are increased almost four times.

*Keywords:* CdSe, MgSe, exciton, quantum well

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