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# Uniform Descriptions of Electron-IO Phonon Interaction in Structures of Multi-layer Coupling Low-dimensional Systems

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Abstract: By using the transfer matrix method, within the framework of the dielectric continuum approximation, uniform forms for the interface optical (IO) phonon modes as well as the corresponding electron-IO phonon interaction Hamiltonians in n-layer coupling low-dimensional systems (including the coupling quantum well (CQW), coupling quantum-well wire (CQWW), and coupling quantum dot (CQD)) have been presented. Numerical calculations on the three-layer asymmetrical AlGaAs/GaAs systems are performed, and the analogous characteristics for limited frequencies of IO phonon in the three types of systems (CQW, CQWW, and CQD) when the wave-vector and the quantum number approach zero or infinity are analyzed and specified.

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Key words: three-layer asymmetrical AlGaAs/GaAs heterostructures, planar and curved heterostructures, transfer matrix method, electron-phonon interaction, coupling quantum systems

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