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Optical phonon and scattering in uniaxial crystals

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We investigate Frohlich-like electron--optical-phonon interactions in uniaxial crystals based on the macroscopic dielectric continuum model. In general, the optical-phonon branches support mixed longitudinal and transverse modes due to the anisotropy. For heterostructures with double interfaces and superlattices, it is known that confined, interface, and half-space optical phonon modes exist in zincblende crystals. In uniaxial structures, additional propagating modes may exist in wurtzite heterosystems due to anisotropic phonon dispersion. This is especially the case when the dielectric properties of the adjacent heterostructure materials do not differ substantially. The dispersion relations and the interaction Hamiltonians for each of these modes are derived.