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Band structure of core-shell semiconductor nanowires[1] MATS-ERIK PISTOL, Dept. of Solid State Physics, Lund University, Sweden, CRAIG PRYOR, Dept. of Physics and Astronomy, University of Iowa — We present band structures of strained core-shell nanowires composed of zincblende III-V (binary) semiconductors. We consider all combinations of AlN, GaN, InN, and all combinations of AlP, GaP, AlAs, GaAs, InP, InAs, AlSb, GaSb, and InSb. We compute the Γ- and X-conduction band minima as well as the valence band maximum, all as functions of the core and shell radii. The calculations were performed using continuum elasticity theory for the strain, eight-band strain-dependent $\boldsymbol{k \cdot p}$ theory for the Γ-point energies, and single band approximation for the X-point conduction minima. We identify structures with type-I, type-II and type-III band alignment, as well as systems in which one material becomes metallic due to a negative band-gap. We identify structures that may support exciton crystals with and without photoexcitation. We have also computed the effective masses, from which the confinement energy may be estimated. All the results [Pistol and Pryor, Phys. Rev. B 78, 115319] are available in graphical and tabular form at www.semiconductor.physics.uiowa.edu

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