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Raman Scattering from Surface Optic Phonons in Cylindrical and Rectangular Cross-sectional Semiconducting Nanowires QIHUA XIONG, JINGUO WANG, L. C. LEW YAN VOON, (Department of Physics, Wright State University, Dayton OH 45435), P. C. EKLUND, The Pennsylvania State University, University Park, PA 16802 — Raman scattering from surface optic (SO) phonons has been observed and identified in cylindrical GaP and rectangular cross-section ZnS nanowires. We propose that the symmetry breaking mechanism which activates the SO phonon is a periodic modulation of the cross-sectional area along the nanowires. In the case of cylindrical GaP nanowires, Raman scattering from SO phonons in air at room temperature is observed at 394 cm-1, in between the first order longitudinal optic (LO) (401 cm-1) and transverse optic (TO) (367 cm-1), and downshift to 392 cm-1 in dichloromethane (?m=2.0) and 390 cm-1 in aniline (?m=2.56). Raman scattering from the ZnS nanowires in air at room temperature reveals a strong first-order LO mode at 346 cm-1 and two TO modes at 269 and 282 cm-1. The SO Raman band in ZnS is observed at 335 cm-1 in air, and downshifts to 328 cm-1 in dichloromethane and to 326 cm-1 in aniline. The position of the SO band in GaP and ZnS nanowires is consistent with a dielectric continuum model. Theoretical SO phonon dispersion for both cylindrical and rectangular cross-section nanowires is presented and compared to experiment. †This work was supported by the NSF NIRT program (DMR- 0304178).

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