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Anisotropic Casimir interactions between a one-dimensional object (nanotube) and a polar substrate SLAVA V. ROTKIN, Physics Dept, Lehigh University, ALEXEY G. PETROV, Ioffe Institute, JOHN A. ROGERS, Beckman Institute, UIUC — The energy of Casimir interaction of a polarizable one-dimensional object (1DO), e.g. a nanotube, and a polar substrate was estimated. Within our model the energy of the dipole moment induced in the 1DO by the external electric field of the fluctuations of the quantized surface optical phonon modes is evaluated. Such polariton modes are known to exist in polar insulators and have the electric field with an exponentially decreasing wing in vacuum. If the polarization tensor of the 1DO is not isotropic, an orientation dependent Casimir force may arise. To the best of our knowledge, such anisotropic Casimir interaction has not been considered before and may lead to an orientation of long flexible objects, like nanotubes, at polar substrates. The interaction energy is derived analytically for the case of a single-wall nanotube on the ST-cut quartz. Besides a material dependent energy constant, it is proportional to the ratio of the volume of interacting segment of the nanotube and cube of the distance to the substrate.

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