Tunable filtering properties of an annular periodic multilayer structure containing lithium niobate

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Abstract

The optical properties of an annular periodic structure made of air and lithium niobate (LiNbO3) layers are theoretically investegated. We use the theory of the refractive index for LiNbO3 layers together with the transfer matrix method for the cylindrical waves developed by Kaliteevski et al., to calculate the reflectance spectra for the TE wave of an annular Bragg reflector. It is demonstrated that by changing the refracive index of LiNbO3 under the control of applying voltage, the locations of band edges in the photonic band gaps can be tunable not only for plannar Bragg reflectors but also for annular Bragg reflectors. Furthemore, the wavelength-dependent reflectance at mode number m=0 is nearly identical to that of the planar one-dimensional Bragg reflector. The reflectance spectra for the TE wave at different values of m are also given and compared.

Keyword：Annular periodic structure. LiNbO3. Annular Bragg reflector. Cylindrical waves.