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标题: Characterization of cylindrical terahertz metallic hollow waveguide with multiple dielectric layers
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摘要: Dielectric-coated metallic hollow waveguides (DMHW) are drawing considerable attention for their application in terahertz (THz) waveguiding. This paper theoretically analyzes the multilayer structure to reduce the transmission and bending loss of DMHW. The efficiency of THz multilayer DMHW depends on a proper selection of dielectric materials and geometrical parameters. The low-loss properties are demonstrated by studying the multilayer gold waveguides with a stack of polypropylene (PP) and Si-doped polypropylene (PPSi). Comparisons are made with single-layer Au/PP and Au-only waveguides. The effect of dielectric absorption is discussed in detail. It is found that low index dielectric causes more additional loss than that of high index dielectric layers. Several design considerations for the THz multilayer DMHW are pointed out by studying the effects of multilayer structure parameters with a stack of polyethylene (PE) and TiO2-doped polyethylene (PETiO2). We conclude that the inner radius of the waveguide and the refractive indices of the dielectrics tend to be larger in order to reduce the influence of material absorption. An optimal value exists for the total number of layers when the dielectrics are absorptive. The absorption tolerances are pointed out to guarantee a smaller loss for multilayer DMHW than that of metal-only waveguide. Finally, a fabrication method for THz multilayer DMHW Ag/PE/PETiO2 is proposed based on co-rolling technique. (C) 2012 Optical Society of America
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