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标题: Terahertz subwavelength ribbon waveguide based plasmonic sensors for refractive index and thickness detection
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摘要: A terahertz plasmonic waveguide sensor is experimentally demonstrated to utilize surface waves propagated in a one-dimension metal grating that constructed on a plastic ribbon waveguide. The grating conformation couples evanescent waves of a subwavelength terahertz waveguide onto the metal surface and highly confines the extended powers within lambda/22-range for the phase-matching condition. The confined terahertz waveguiding waves resemble surface plasmon-polaritons but transmit with almost zero dispersion when the coupled surface waves interfere along the metal grating. Based on the dispersion-free guidance, there is Bragg reflection dominated by grating periods and strongly dependent on the refractive index of surface plasmon-polaritions. We successfully detect different thicknesses of polyethylene layers covered on the metal grating with thickness resolution of 1 mu m when the effective waveguide indices are modified in the vicinity of the metal grating, corresponding to 0.01-index variation. Potentially, terahertz subwavelength ribbon waveguide based plasmonic sensors could be manipulated to detect molecules with extremely low-density or small thickness in the metal-dielectric interface for probing pollution particles and any label-free detection.
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