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论文

介质填充浅槽周期结构表面上的太赫兹表面等离子体激元

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摘要:

通过在金属表面刻成浅的垂直凹槽,并在槽内填充不同的介质,对金属表面浅槽周期结构上传播的表面等离子体激元的色散特性与填充介质的关系进行了研究.研究表明通过在周期凹槽内填充介质可以有效降低人工表面等离子体激元的渐近频率,并增强金属表面对电磁场的约束.分析了太赫兹波段金属的吸收损耗对人工表面等离子体激元特性的影响,结果显示基于填充介质的浅槽周期表面结构可以获得长距离传输以及场的亚波长约束.通过对波传输的数值仿真,验证了该表面结构在太赫兹波段良好的导波能力.这种表面结构对太赫兹波段新型集成导波器件的设计具有参考价值.

关键词: 表面等离子体激元 太赫兹波 波导 亚波长约束

Terahertz Surface Plasmon Polaritons on Metal Surfaces Corrugated by Shallowly Dielectric-filled Grooves

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Abstract:

Surface plasmon polaritons (SPPs) propagating along a metal surface corrugated with an array of shallow grooves filled with dielectric are studied analytically. It is shown that the asymptotic frequency of SPPs can be greatly decreased by stuffing the grooves with dielectric, and thus the fields exhibit much better confinement. In the THz frequency range, the influence of the absorption in real metal on the performance of spoof SPPs is also examined. The numerical calculations show that long propagation length and subwavelength field confinement are simultaneously available for spoof SPPs on the real surface corrugated with grooves stuffed by the dielectrics. The good guiding ability of the structured surface at THz frequencies is further verified by numerical simulations of wave transmission. The proposed structure may lead to a new design of devices for routing terahertz radiation in highly integrated circuits.

Keywords: Surface Plasmon Polaritons(SPPs) Terahertz radiation Waveguide Subwavelength field confinement

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