

## Interfacial operator method for surface plasmon polaritons in metal waveguides

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Surface plasmon polaritons in metal waveguides are studied by using the interfacial operator method [1]. Rectangular parallelepiped strip metal waveguides on a dielectric substrate and line-defect type metal waveguides of periodic structure are studied [2]. The band structures are calculated by using the interfacial operator method, and the field propagations are simulated by using the finite-difference time-domain (FDTD) method.

The interfacial operator method is better than the FDTD method in several aspects for a band structure calculation of surface plasmon polaritons. First, the former is more direct than the latter in a band structure calculation enabling us to get eigenvalues of discrete Maxwell's equations, while the FDTD method investigates how a launched field propagates in time. Second, in the interfacial operator method all frequencies are automatically concerned since the frequency dependency is included in the discrete Maxwell's equations, while in the FDTD method only a certain frequency range is involved.

This is the first report to our knowledge that the interfacial operator method is used for the analysis of a strip and a line-defect type metal waveguides.

[1] S. I. Bozhevolnyi, *Physical Review Letters*, **86**, 3008 (2001)

[2] R. -L. Chern, Chien. C. C, and C. C. Chang, *Physical Review B*, **73**, 235123 (2006).