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Generation of dynamic metamaterial by using spoof surface plasmon on patterned silicon substrate assisted with microplasma array DAE-SUNG LEE, OSAMU SAKAI, KUNIHIDE TACHIBANA, Department of Electronic Science and Engineering, Kyoto University, Kyoto-daigaku Katsura, Nishikyo-ku, Kyoto, 615-8510, Japan, KYOTO UNIVERSITY TEAM — Recently, there has been a growing interest in metamaterials which are designed as composite materials and show extraordinary macroscopic properties. Dynamic metamaterials composed of an integrated assembly of microplasma with a 2D periodic structure, whose electron density is 10^{13}-10^{16} cm^{-3} and spatial distribution is macroscopically homogeneous and microscopically has a functional structure, have a potential to design the electromagnetic and optical properties of materials for a variety of applications. An array of microplasma cells was fabricated on a silicon substrate, which can not only be partially transparent in the terahertz spectral range but serve as a discharge electrode, and characteristics of a 2D dynamic metamaterial were investigated by terahertz wave time-domain spectroscopy. Such a periodic structure gives rise to an effective impedance or permittivity for surface modes which enables abnormal transmittance arising partly from spoof surface plasmons. In addition, since it is possible to control the generation of microplasmas by external parameters, permittivity of a metamaterial in bulk can be adjusted dynamically.

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