Abstract for an Invited Paper
for the DPP09 Meeting of
The American Physical Society

Microplasma assembly for novel electromagnetic media

OSAMU SAKAI, Kyoto University

Microplasmas whose sizes are smaller than a few millimeters can perform functionality for chemical micro-reactors, conversion fields for biomaterials, and interactive media for photons. In particular, as far as interaction with photons or electromagnetic waves is concerned, in addition to microplasma generation and photon emission in an intensified electric field of waves, microplasmas can also play a number of potential roles of controllers for propagating waves. This report focuses on novel physics of microplasma assembly for electromagnetic media [1]. When we make an assembly composed of microplasmas, novel functions are expected due to its complex dielectric function arising from dielectric and lossy properties. The dielectric property creates photonic band gaps (PBGs), and the lossy property drastically changes transmittance around the PBGs. As a result, a "complex" dispersion relation or band diagram in the three-dimensional space of real and imaginary wavenumbers and wave frequency will open new possibilities to control electromagnetic waves by complex-value filters composed of microplasma assembly.

[1] O. Sakai et al., Plasma Physics and Controlled Fusion, vol. 49 (2007), pp. B453-B463.