Comment of the Cover Photograph
Diamond Photonic Crystals with Alumina Micro Lattices

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Photonic crystals with periodic arrangements in dielectric constant can totally reflect electromagnetic waves by Bragg diffraction. Alumina micro lattices with diamond structure were fabricated in order to control terahertz wave expansions effectively by using micro stereolithography of a computer aided design and manufacturing (CAD/CAM) process. The photonic crystals composed of acrylic lattice with alumina nanoparticles dispersion were fabricated. In the micro stereolithography process, photo sensitive resin pastes with alumina nanoparticles dispersion were spread on a grass substrate with 10 µm in layer thickness by using a mechanical knife edge, and two dimensional images of ultra violet ray were exposed by using digital micro-mirror device (DMD) with 2 µm in part accuracy. Through the layer by layer stacking process, micrometer order three dimensional structures were formed. Dense alumina structures were obtained by successive dewaxing and sintering in an air atmosphere. The electromagnetic wave properties of these samples were measured by using a terahertz time domain spectroscopy (TDS) device. The micrometer order periodic structures exhibited perfect band gaps in the terahertz wave frequency range. In near future, the terahertz waves with micrometer order wavelength will be expected to apply for various types of novel sensors, which can detect gun powders, drugs, bacteria in foods, micro cracks in electric devices, cancer cells in human skin and other physical, chemical and living events. The fabricated alumina photonic crystals will be applied for the terahertz wave devices.