Water-Based Metasurfaces for Effective Switching of Microwaves

All-dielectric metasurfaces have recently attracted great attention in the artificial material design and related applications. Among a variety of materials, water was recently proposed for strongly resonant inclusions in such configurations due to its relatively high permittivity. We presently design and characterize polarization-sensitive metasurfaces with simple and easily fabricated "rod-like" water inclusions in a low-permittivity host, which may be tuned mechanically by rotation. Excellent agreement is reported between simulations and the experimental results, obtained in an L-band waveguide environment. Moreover, we show effective guiding and switching effects of the fields radiated by a dipole antenna located next to a stack of metasurfaces. The proposed metasurfaces may be very convenient for a variety of microwave applications owing to the low cost, abundance, and bio-friendly nature of water.
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