330. Title:Suspended core subwavelength fibers: Towards practical designs for low-loss terahertz guidance
Authors:Rozé, Mathieu (1); Ung, Bora (1); Mazhorova, Anna (1); Walther, Markus (2); Skorobogatiy, Maksim (1)
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Abstract:In this work we report two designs of subwavelength fibers packaged for practical terahertz wave guiding. We describe fabrication, modeling and characterization of microstructured polymer fibers featuring a subwavelength-size core suspended in the middle of a large porous outer cladding. This design allows convenient handling of the subwavelength fibers without distorting their modal profile. Additionally, the air-tight porous cladding serves as a natural enclosure for the fiber core, thus avoiding the need for a bulky external enclosure for humidity-purged atmosphere. Fibers of 5 mm and 3 mm in outer diameters with a 150 μm suspended solid core and a 900 μm suspended porous core respectively, were obtained by utilizing a combination of drilling and stacking techniques. Characterization of the fiber optical properties and the subwavelength imaging of the guided modes were performed using a terahertz near-field microscopy setup. Near-field imaging of the modal profiles at the fiber output confirmed the effectively single-mode behavior of such waveguides. The suspended core fibers exhibit transmission from 0.10 THz to 0.27 THz (larger core), and from 0.25 THz to 0.51 THz (smaller core). Due to the large fraction of power that is guided in the holey cladding, fiber propagation losses as low as 0.02 cm-1 are demonstrated specifically for the small core fiber. Low-loss guidance combined with the core isolated from environmental perturbations make these all-dielectric fibers suitable for practical terahertz imaging and sensing applications.