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Terahertz axicone made of nanoporous SiO_2

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We have shown in the previous articles [1,2], that nanoporous SiO_2, namely, artificial opals, are promising terahertz (THz) optical materials with no dispersion in the frequency range 0.1-2.5 THz, low absorption and quite a unique ability to vary the effective refractive index in a wide range (1.6-1.95) only by annealing. In this work, we fabricate THz axicone by direct sedimentation of the opal colloidal suspension into a mold. The axicone was dried and annealed in order to achieve higher refractive index. Next, we study fabricated axicone using a homemade THz imaging setup. Experimental results were compared with theoretical considerations. Obtained results show that artificial opals have a great potential for THz applications.

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[1] Ulitko, V.E. et. al. *Nanoporous SiO_2 based on annealed artificial opals as a favorable material platform of terahertz optics*, Optical Materials Express, **10**(9), 2100, 2020. DOI:10.1364/OME.402185;

[2] Ulitko, V.E. et. al. *Opal-based terahertz optical elements fabricated by self-assembly of porous SiO_2 nanoparticles*, Optics Express **29**(9), 13764, 2021. DOI:10.1364/OE.422637.