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Experimental demonstration waveguide with arbitrary bending angles in hyperuniform disordered photonics materials WEINING MAN, San Francisco State University, MARIAN FLORESCU, University of Surrey, SEYED HASHEMIZAD, ERIC WILLIAMSON, DEVIN LINER, YINGQUAN HE, BRIAN LEUNG, San Francisco State University, PAUL CHAIKIN, New York University
— Contradicting to the long standing intuition that long-range translational order is required in photonic band gap formation, recently a new class of disordered hyperuniform materials was predicted to possess sizeable photonic band gaps. We report the first experimental demonstration of complete and isotropic photonic band gap for all polarizations in such disordered hyperuniform structures made of alumina with a dielectric constant of 8.7. In periodic structures there are only a limited number of allowed rotational symmetries; hence bending angles of waveguiding channels are greatly limited. In isotropic hyperuniform disordered structures there are no preferential symmetry directions and waveguiding channels can be constructed with arbitrary bending angles. In our study, near 100 percent transmission of electromagnetic waves around sharp corners of arbitrary angles with bending radii smaller than one wavelength are observed experimentally. The hyperuniform disordered structures also enable the realization of isotropic confinement of radiation in cavities and can be used as flexible optical insulator platforms.

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