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3D octagonal quasicrystals fabricated by phase mask lithography
TAEYI CHOI, ION BITA, EDWIN THOMAS, Massachusetts Institute of Technology — Quasicrystals were discovered in 1984 and have shown unusual physical and mechanical properties. Artificially patterned quasicrystalline structures have attracted a lot of attention due to their promise as photonic and phononic crystals. A challenge is to create 3D quasicrystalline patterns on the 100nm scale. Using phase mask lithography, we successfully fabricated in photopolymer films 3D quasicrystals having eight-fold rotation axes on a submicron length scale. Conformable phase masks of eight-fold rotation symmetry were first made with multiple interference lithography on a silicone substrate. Light at normal incidence to the phase mask generates a 3D distribution of intensity with quasicrystalline eight-fold symmetry. This intensity distribution is then transferred into a photosensitive material, SU8, generating 3D quasiperiodic structures that we further characterize both structurally and optically.

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