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Designing Phoxonic Metamaterials with Fractal Geometry SISI NI, Institute for Soldier Nanotechnologies, Department of Materials Science and Engineering, Massachusetts Institute of Technology,, CHEONG YANG KOH, Defense Science Organization, Singapore, STEVE KOOI, EDWIN THOMAS, Institute for Soldier Nanotechnologies, Department of Materials Science and Engineering, Massachusetts Institute of Technology, — Recently, the concepts of fractal geometry have been introduced into electromagnetic and plasmonic metamaterials. With their self-similarity, structures based on fractal geometry should exhibit multi-band character with high Q factors due to the scaling law. However, there exist few studies of *phononic* metamaterials based on fractal geometry. We use COMSOL to investigate the wave propagation in two dimensional systems possessing fractal geometries. The simulations of these systems, guided by our recently developed general design framework, help to understand the role of design in determining the phononic properties of the structures. Proposed structures are being fabricated via standard lithographic or 3D printing techniques. The wave behavior of the structures can be characterized using Brillouin Light Scattering, Scanning Acoustic Microscope and Near-field Scanning Optical Microscopy. Due to their sparse spatial distribution, fractal phononic structures show potential fir "smart skin", where multifunctional components can be fabricated on the same platform.

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