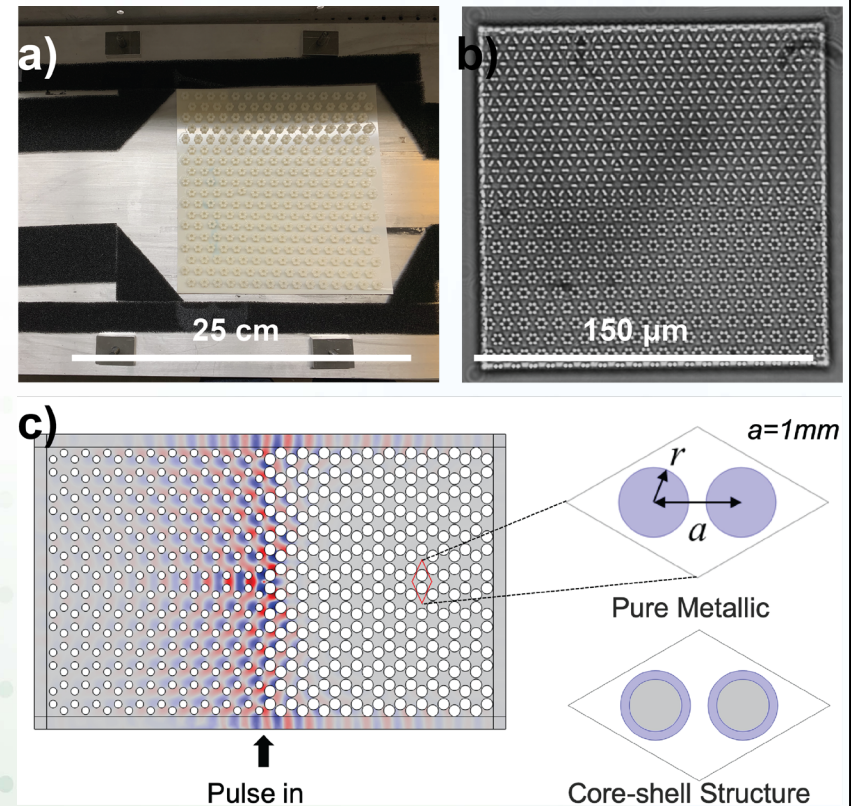


Controlling waves with 3D printed materials

R. Goldsmith, C. Ma, T. Osswald, P. Campagnola, Z. Yu
University of Wisconsin-Madison

Materials with a repetitive pattern the same size as the wavelength of a wave can be used to control the wave, causing it to bend, perfectly reflect or transmit, or even turn around corners. Where different patterns meet, even more exotic behavior occurs, including making highways for light or sound that only travel in one direction or where the waves cannot be dissipated.

Synthesizing such materials is a major challenge, which Wisconsin MRSEC researchers have met by adapting a family of 3D printing techniques. 3D printing can be used to make structures small enough for mid-infrared wavelengths or large enough for microwaves or ultrasound. Fast, flexible synthesis enables rapid realization of new materials designs, and promises manufacturable materials for applications including new types of lasers, quantum communication platforms, and ways of imaging biological tissues.



Materials can be made to give microwaves (a), infrared waves (b), or sound waves (c) unusual topological properties.