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Integrating ultrasound directed self-assembly and additive manufacturing to fabricate engineered materials

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Meeting abstract. No PDF available.**ABSTRACT**

Engineered materials comprising specifically designed patterns of particles embedded in a matrix material can display exotic physical properties when interacting with an external field, such as metamaterials (electromagnetic wave field) and structural materials (force field), to only name a few. Altering the pattern of particles that constitutes the microstructure of the engineered material enables tuning its properties. We describe a fabrication process to implement macroscale engineered materials layer-by-layer using additive manufacturing, where in each layer we organize a user-specified pattern of particles using ultrasound directed self-assembly to tailor the microstructure of the material. In contrast with previous demonstrations of fabricating engineered materials that are limited to laboratory-scale and/or 2D implementations, this process enables fabricating macroscale specimens with complex 3D geometry required for engineering applications. Hence, this platform technology has significant implications for fabricating engineered materials relevant to a wide range of applications including manufacturing of composite materials, engineered materials for acoustic and electromagnetic cloaking and sub-wavelength imaging, and 3D printing structures with embedded electrical wiring, among others.

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