

## **Biomimetic Design for Periodic Microstructural Materials**

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Nature evolves to its current form to adapt external environments over many years, which demonstrate some significant mechanical, biological and physical features that most of man-made materials do not have. As an ultra-light structure, cuttlebone is a natural cellular material possessing a remarkable combination of material properties, including high compressive strength and excellent permeability. Existing research has attempted to utilize these remarkable properties in a range of advanced applications, including tissue scaffold and superconductor fabrication. This study aims to develop a multiscale modeling approach to characterization of cuttlebone microstructure by using microscopic computerized tomography (microCT) method. The finite element based homogenization technique is adopted for estimating the effective properties from microCT based representative volume element (RVE). Such material properties as bulk modulus, shear modulus and diffusivity, etc are considered herein. The effective properties are then used as design criteria for multiobjective optimization of periodic microstructural materials.

**Keywords:** Multiscale, homogenization, biomimetic design, multiobjective optimization.