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Building implicit-surface-based composite porous architectures

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Abstract

We propose a simple but effective implicit-surface-based (ISB) method for constructing composite porous scaffolds (including gradient, hybrid, hierarchical, stochastic porous structures, or their combinations) based on a certain number of control elements (points, line segments, polylines, polygons, etc.) that are provided by users. Our method efficiently integrates spatial partitioning and substructure assignments in an easy manner. Users need not consider complex transitions between substructures during design, as these are naturally constructed. Also, our method can easily reconstruct native tissue structures based on micro-CT data. Here we successfully fabricated porous scaffolds with polymer as well as titanium using additive manufacturing (AM) techniques for ready use in tissue engineering.

Keywords: composite structures; porous scaffolds; implicit surfaces; tissue engineering; additive manufacturing.

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