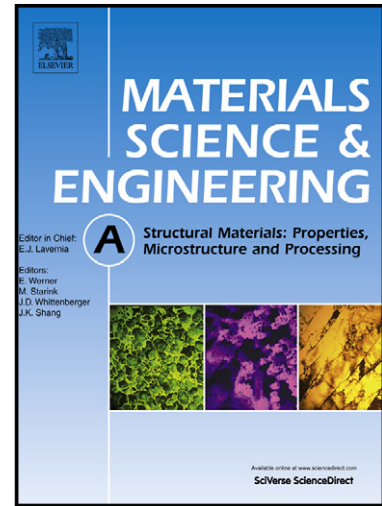


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Zixing Lu, Zeshuai Yuan, Qiang Liu, Zijun Hu, Fan Xie, Man Zhu



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Multi-scale simulation of the tensile properties of fiber-reinforced silica aerogel
composites

Zixing Lu^{a,*}, Zeshuai Yuan^a, Qiang Liu^a, Zijun Hu^b, Fan Xie^a, Man Zhu^a

^a Institute of Solid Mechanics, Beihang University, Beijing, 100191, China

^b National Key Laboratory of Advanced Functional Composite Material Technology,
Beijing, 100076, China

* Corresponding author

TEL: +86 10 82315707; FAX: +86 10 82318501

E-mail: luzixing@buaa.edu.cn

Abstract

A new multi-scale model is proposed to investigate the relationship between the mechanical properties and microstructure of fiber-reinforced silica aerogel composites. The multi-scale model consists of the aerogel model in nanometers and the composite model in micrometers. The aerogel model is generated to represent the cluster structure of silica aerogels based on a modified diffusion-limited cluster aggregation (DLCA) algorithm, in which the size-dependent interactions between the primary particles are obtained from theoretical derivations. A continuum damage constitutive model is established to represent the behavior of the silica aerogel matrix in the composite by implementing the aerogel model with the discrete element method (DEM). After that, a modified embedded element technique (EET) is proposed to

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