

Accepted Manuscript

Elastic dependence of particle-reinforced composites on anisotropic particle geometries and reinforced/weak interphase microstructures at nano- and micro-scales

Wenxiang Xu, Yang Wu, Mingkun Jia

PII: S0263-8223(18)31923-8

DOI: <https://doi.org/10.1016/j.compstruct.2018.07.009>

Reference: COST 9926

To appear in: *Composite Structures*

Received Date: 26 May 2018

Revised Date: 27 June 2018

Accepted Date: 2 July 2018



Please cite this article as: Xu, W., Wu, Y., Jia, M., Elastic dependence of particle-reinforced composites on anisotropic particle geometries and reinforced/weak interphase microstructures at nano- and micro-scales, *Composite Structures* (2018), doi: <https://doi.org/10.1016/j.compstruct.2018.07.009>

This is a PDF file of an unedited manuscript that has been accepted for publication. As a service to our customers we are providing this early version of the manuscript. The manuscript will undergo copyediting, typesetting, and review of the resulting proof before it is published in its final form. Please note that during the production process errors may be discovered which could affect the content, and all legal disclaimers that apply to the journal pertain.

Elastic dependence of particle-reinforced composites on anisotropic particle geometries and reinforced/weak interphase microstructures at nano- and micro-scales

Wenxiang Xu^{*}, Yang Wu, Mingkun Jia

Institute of Structures and Materials Mechanics, College of Mechanics and Materials, Hohai University,

Nanjing 211100, China

Abstract: This contribution sheds light on the coupled effects of anisotropic particle geometries (i.e., shape and size) and reinforced/weak interphase characteristics (i.e., volume fraction, thickness, moduli and Poisson ratio) on the elastic properties of particle-reinforced composites (PRCs) at nano- and micro-scales. A powerful micromechanics approach that incorporates interphase microstructures into the average-field theory is used to predict the effective elastic modulus, Poisson ratio, shear modulus and bulk modulus of three-phase PRCs including spheroidal nano-/micro-particles, reinforced/weak interphase and matrix. Comparison with measurements indicates this optimized model is a reliable means to evaluate the elastic properties of three-phase PRCs at nano- and micro-scales. Plus, the results show that the elastic response of PRCs strongly depends on the coupled effects of the aspect ratio and geometrical size factor of spheroidal nano-/micro-particles and the volume fraction of reinforced/weak interphase, suggesting that the properties of such materials can be tailored via proper composite engineering and design.

Keywords: Particle-reinforcement; Anisotropy; Elasticity; Interface/interphase; Micro-mechanics

1. Introduction

It is well-known that interphase interacted by anisotropic nano-/micro-sized particles broadly exists in particle-reinforced composites (PRCs) such as polymer-matrix, ceramic-matrix and cement-matrix

^{*} Correspondence to: Institute of Structures and Materials Mechanics, College of Mechanics and Materials, Hohai University, Nanjing 211100, P.R. China.

E-mail address: xwxfat@gmail.com (W. Xu).

Download English Version:

<https://daneshyari.com/en/article/6702540>

Download Persian Version:

<https://daneshyari.com/article/6702540>

[Daneshyari.com](https://daneshyari.com)