
# Characterization on the anisotropic slip for flows over unidirectional fibrous porous media for advanced composites manufacturing

Jingang Lu, Hye Kyeong Jang, Sang Bok Lee, Wook Ryol Hwang

PII: S1359-835X(17)30170-7
DOI: http://dx.doi.org/10.1016/j.compositesa.2017.04.021
Reference: JCOMA 4648

To appear in: *Composites: Part A*

Received Date: 24 December 2016
Revised Date: 26 April 2017
Accepted Date: 27 April 2017

Please cite this article as: Lu, J., Jang, H.K., Bok Lee, S., Hwang, W.R., Characterization on the anisotropic slip for flows over unidirectional fibrous porous media for advanced composites manufacturing, *Composites: Part A* (2017), doi: http://dx.doi.org/10.1016/j.compositesa.2017.04.021

# Characterization on the anisotropic slip for flows over unidirectional fibrous porous media for advanced composites manufacturing

Jingang Lu[1], Hye Kyeong Jang[1], Sang Bok Lee[2], Wook Ryol Hwang[1,*]

[1]School of Mechanical Engineering, Research Center for Aircraft Parts Technology (ReCAPT), Gyeongsang National University, Jinju, 52828, Korea

[2] Composites Research Division, Korea Institute of Materials Science, Changwon, 51508, Korea

Submitted on 25th December, 2016

First revision: 27th March, 2017

Second revision: 24th April, 2017

ABSTRACT

The anisotropic velocity slip at interfaces of unidirectional fibrous porous media is modeled via an effective tensorial Navier-slip model and, through extensive numerical simulations, the slip length tensor is fully characterized in a closed form for the applications to composites manufacturing. The slip tensor model replaces complicated fiber architecture at the interface by effective smooth surfaces and it has been validated in comparison with direct simulation for flows over the porous media. The slip model yields reduction in computational cost significantly, while keeping the accuracy in flow solutions. Transverse and longitudinal slip lengths have been explored with characteristic parameters such as flow channel height, fiber fractions, porous architectures and permeability. The dimensionless void length is proposed as a single parameter that determines universal behaviors of slip length. Finally we report a complete set of fitted equations that facilitates estimation of slip length and slip coefficient for a given fibrous media.

**Key words:** A. Fabrics/textiles; B. Anisotropy; C. Transport phenomena analysis; E. Liquid composites molding