

Abstract Submitted  
for the DFD17 Meeting of  
The American Physical Society

**On the examination of Darcy permeability of soft fibrous porous media; New correlations.**<sup>1</sup> ZENGHAO ZHU, QIUYUN WANG, QIANHONG WU, Villanova University — In this presentation, we report a novel experimental approach to investigate the compression-dependent Darcy permeability of soft porous media. Especially, we are proposing new correlations that describe the change of the permeability of random fibrous porous media as a function of its compression. A special device was developed that consisted of a rectangular flow channel with adjustable gap thickness ranging from 3 mm to 20 mm. Air was forced through the thin gap filled with testing fibrous materials. By measuring the flow rate and the pressure gradient, we have successfully obtained the Darcy permeability of different fibrous porous materials at different compression ratios. Theoretical or semi-empirical models have been compared with the experimental results, indicating various degrees of disagreement. The new correlations were then proposed which fit with experimental data very well. The study presented herein provides a useful approach to evaluate the change of the permeability of fibrous porous media as a function of its compression. It will be valuable for examining fluid flow in fibrous porous media where the permeability is difficult to be measured directly. This kind of porous media widely exists in biological systems.

<sup>1</sup>This research was supported by the National Science Foundation under Award No.1511096.

Zenghao Zhu  
Villanova University

Date submitted: 28 Jul 2017

Electronic form version 1.4