

Accepted Manuscript

Experimental and numerical investigation of fluid flow hydrodynamics in porous media: Characterization of Darcy and non-Darcy flow regimes

Partha Kundu, Vimal Kumar, Indra M. Mishra

PII: S0032-5910(16)30620-9
DOI: doi: [10.1016/j.powtec.2016.09.037](https://doi.org/10.1016/j.powtec.2016.09.037)
Reference: PTEC 11947

To appear in: *Powder Technology*

Received date: 16 December 2015
Revised date: 12 September 2016
Accepted date: 14 September 2016



Please cite this article as: Partha Kundu, Vimal Kumar, Indra M. Mishra, Experimental and numerical investigation of fluid flow hydrodynamics in porous media: Characterization of Darcy and non-Darcy flow regimes, *Powder Technology* (2016), doi: [10.1016/j.powtec.2016.09.037](https://doi.org/10.1016/j.powtec.2016.09.037)

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.

Experimental and numerical investigation of fluid flow hydrodynamics in porous media: characterization of Darcy and non-Darcy flow regimes

Partha Kundu^a, Vimal Kumar^{a*}, Indra M. Mishra^{a,b*}

^aDepartment of Chemical Engineering, Indian Institute of Technology, Roorkee, Roorkee-247667, Uttarakhand, India.

^bDepartment of Chemical Engineering, Indian Institute of Technology (Indian School of Mines), Dhanbad, Dhanbad-826004, Jharkhand, India.

Abstract

In the present study, incompressible single phase fluid percolation through different types (homogeneous and mixed isotropic) of porous media is investigated experimentally. The functional relation of pressure gradient with velocity was presented on the basis of dimensional analysis in terms of friction factor and Reynolds number based on different characteristic length (i.e. particle diameter and permeability of porous media). The experimental pressure drop data were analyzed by rigorous non-linear regression analysis. The different flow regimes exist in porous media flow were characterized and demarked according to the analysis of solid-fluid interaction, and the generation of the pressure and the viscous drags in terms of different types of Reynolds numbers ($Re_D, Re_p, Re_{\sqrt{K}}$). Three significant flow regimes (pre-Darcy, Darcy and non-Darcy Forchheimer flow regime) with two transition regimes (transition to Darcy and weak inertia flow regime) were observed. In addition, numerical modeling and simulations were also performed to understand the relevant micro-flow phenomena localized in the pore domain and compared the simulation results with experimental data.

Keywords: Porous media, Pore flow regimes, Non-Darcy flow, Permeability, Numerical simulation, Hydrodynamics.

*corresponding authors: vksinfch@iitr.ac.in; Tel.: +91 1332 285694; fax: +91 1332 276535; immishra49@gmail.com; Tel: +91-326-2235227.

Download English Version:

<https://daneshyari.com/en/article/4910898>

Download Persian Version:

<https://daneshyari.com/article/4910898>

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