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FRICTION FACTORS AND INTERNAL FLOW LENGTH SCALES OF GAS-SOLID MAGNETICALLY STABILIZED BEDS IN AXIAL FIELDS - SCALING AND APPLICATIONS TO BED-TO-SURFACE HEAT TRANSFER

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ABSTRACT

Friction factors and internal flow length scales of gas-solid magnetically stabilized beds are discussed. Pressure drop and expansion data of beds stabilized by axial magnetic fields are used. The concept of a variable friction factor of fluid-driven deformable packed bed is discussed. Scaling relationships of the internal flow length scale and the bed overall porosity are developed through three approaches: (i) fluidization approach concerning a length scale proportional to the particle size, (ii) packed bed approach based on a hydraulic diameters as a length scale and (iii) porous media approach based on the Forchheimer equation. The main result is that the , irrespective of the model used, where is the exponent of the Richardson-Zaki scaling law. These scaling estimates are used to explain the magnetic field effects on bed-to-surface heat transfer coefficients.

KEYWORDS

fluidization, magnetic field stabilized bed, friction factor, scaling, Richardson-Zaki law, bed-to surface heat transfer

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