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TRANSPORT PHENOMENA IN VISCOUS FLOW

AND

PARTICLE MOTION IN FLUIDIZED BEDS

by

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DECLARATION

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W.J. Mitchell

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ABSTRACT

GENERALIZED INTERPHASE TRANSPORT PHENOMENA IN NEWTONIAN VISCOUS FLOW

- A single viscous drag relationship applicable to both internal flows through conduits of arbitrary cross-section and external flows over axisymmetric bodies has been developed.
- This has led to a generalised expression for the Chilton-Colburn heat/mass transfer factor, and generalised Sherwood/Graetz relationships.
- The model results have been compared with existing Leveque/Levich type solutions with excellent agreement.
- The work has enabled formulation of an analogy between momentum, mass and heat transport for slow flow conditions.

ACTIVE PARTICLE MOTION IN THE EMULSION PHASE OF A FLUIDIZED BED

- An equation of motion for an active, moving particle in liquid and gas fluidised beds (of inert particles) has been developed and solved.
- Comparisons have been made with the literature, and with experiments as part of the present work.
- The study has illustrated the importance of the formation of a defluidised cap of smaller particles on the top surface of the larger, active, upward moving particle.
- Necessary and sufficient conditions to determine whether an active particle will float or mix in particulate or bubbling fluidised beds have also been developed.