



**TRANSPORT PHENOMENA IN VISCOUS FLOW
AND
PARTICLE MOTION IN FLUIDIZED BEDS**

by

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DECLARATION

This thesis contains no material which has been accepted for the award of any other degree or diploma in any University and, to the best of the author's knowledge and belief, the thesis contains no material previously published or written by another person, except where due reference is made in the text or where common knowledge is assumed.

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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.