# EVALUATION OF THE MINIMUM FLUIDIZATION VELOCITY AT ELEVATED TEMPERATURE AND PRESSURE THROUGH EXPERIMENTS AND MODELLING

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The minimum fluidization velocity is an important measure used in the design and scale-up of fluidized beds. Due to its importance, a large number of experiments over a wide range of operating conditions have focused on this property. Despite this attention, the amount of data where the combined effect of elevated temperature and pressure on the minimum fluidization velocity was investigated is still limited.

In this study the minimum fluidization velocity is determined experimentally in a lab-scale fluidized bed reactor designed for use at elevated temperature and pressure. A central composite design (CCD) is used to design experiments where different operating parameters are varied over a wide range. This includes different particle sizes, pressures up to 5bar and temperatures up to 550°C. The collected data provides the basis for existing correlations, such as that given by Bi and Grace (1), to be evaluated at elevated temperature and pressure and allows for detecting any systematic deviations from the experimental data.

In addition to the experiments, the minimum fluidization velocity and the voidage at minimum fluidization is calculated numerically over the CCD using computational. Several different drag models are evaluated, allowing their relative performances to be assessed and any weaknesses to be identified. Recommendations are made for drag model selection in pressurized fluidized bed reactors.

1. H.T. Bi and J.R. Grace. Flow regime diagrams for gas-solid fluidization and upward transport. Int. J. Multiphase Flow, 21: 1229-1236, 1995.

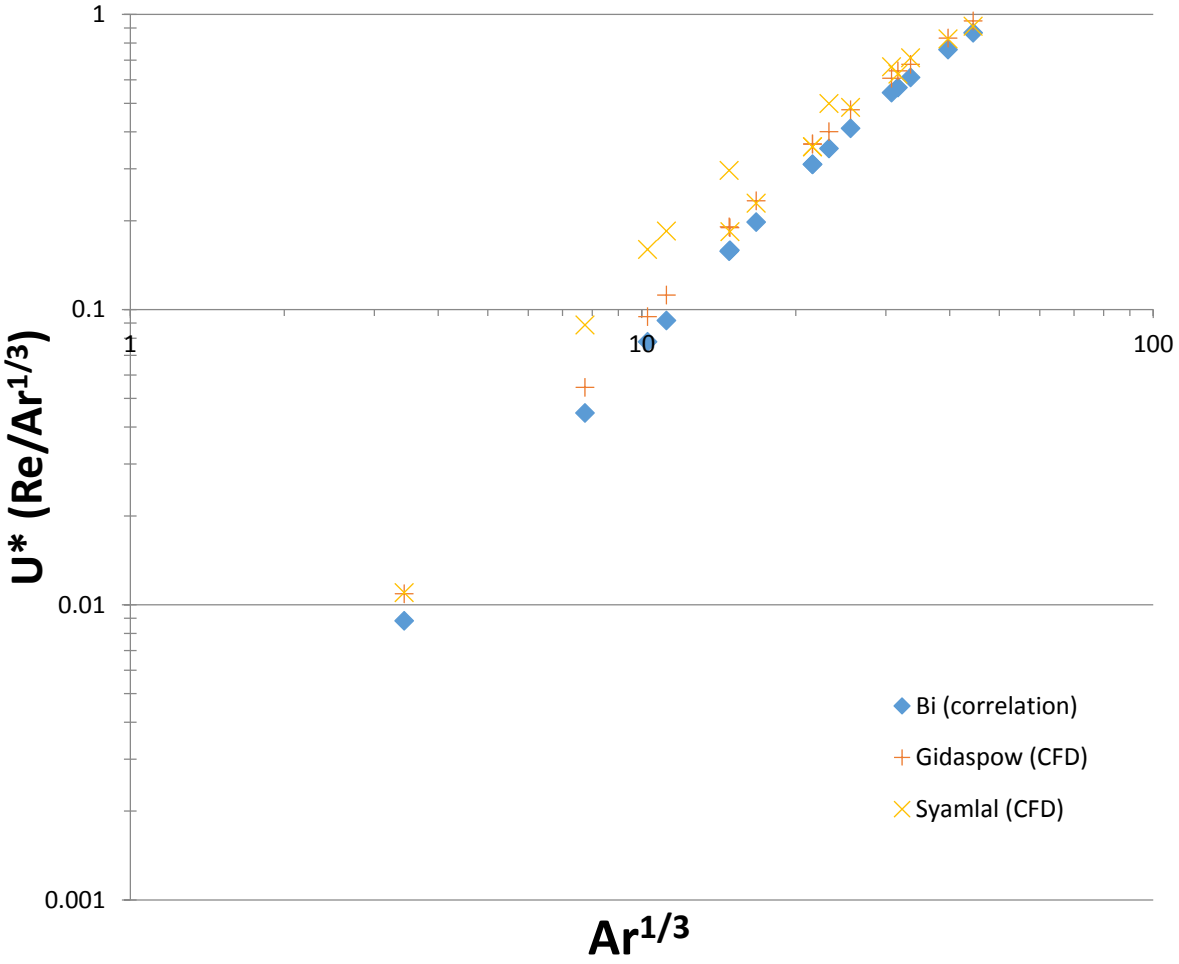


*Figure 1 - Comparison of the minimum fluidization velocity determined from CFD simulations with the correlation of Bi and Grace (1) over a range of particle sizes, temperatures and pressures.*