

27.02.2024

Project work / Bachelor's thesis

Impact of mechanical vibration on bubbling gas-solid fluidized bed hydrodynamics

Motivation:

Enhanced heat and mass transfer resulting from greater solid-fluid interaction in fluidized beds make them a favorable reactor choice in many processes. Fluidization behavior can be further enhanced or even initiated with vibration in certain cases. Additionally, it is possible to decrease the minimum fluidization velocity, reduce gas channeling and particle agglomeration [1,2].

Tasks:

- Determination of the minimum fluidization velocity and time-series analysis of pressure fluctuations in a vibrated pseudo-2D fluidized bed.
- Investigation of bubble characteristics with high-speed camera and image analysis with python.
- Determination of the impact of particle properties on vibrated fluidized bed hydrodynamics.

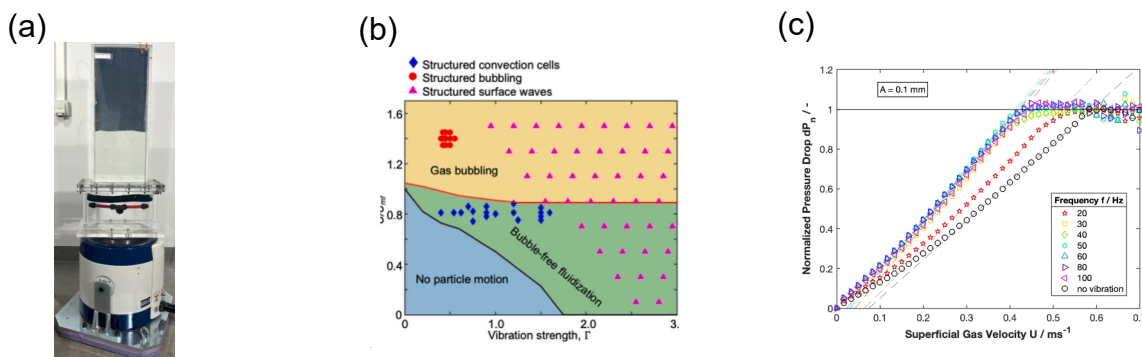


Figure 1: (a) Experimental setup. Fluidized bed is attached to the vibration source, an electrodynamic shaker. (b) Impact of mechanical vibration on fluidized bed hydrodynamics. Different fluidization regimes can be obtained in vibrated fluidized beds [3]. (c) Initial results show the reduction of minimum fluidization velocity with axial vibration.

Starting date:

March/April 2024

Other projects involving vibrated fluidized beds are available for Master's theses, Bachelor's theses, and project work. Feel free to contact for further information.

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[1] Wang, A.; Marashdeh, Q.; Teixeira, F. L.; Fan, L.-S. Applications of Capacitance Tomography in Gas-Solid Fluidized Bed Systems. In *Industrial Tomography*; Elsevier, 2015; pp 529–549. <https://doi.org/10.1016/B978-1-78242-118-4.00020-4>. [2] Penn, A.; Tsuji, T.; Brunner, D. O.; Boyce, C. M.; Pruessmann, K. P.; Müller, C. R. Real-Time Probing of Granular Dynamics with Magnetic Resonance. *Sci. Adv.* 2017, 3 (9), e1701879. <https://doi.org/10.1126/sciadv.1701879>. [3] Guo, Q.; Spittler, C.; Sanghishetty, J. M.; Boyce, C. M. Advances in Vibrated Gas-Fluidized Beds. *Current Opinion in Chemical Engineering* 2023, 42, 100977. <https://doi.org/10.1016/j.coche.2023.100977>.

