HYDRODYNAMICS OF BUBBLE COLUMNS WITH VIBRATING INTERNALS

by

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CERTIFICATE

This is to certify that the thesis entitled, '***Hydrodynamics of Bubble Columns with Vibrating Internals***' being submitted by **Mr. V. Balamurugan** to the Indian Institute of Technology, Delhi for award of Doctor of Philosophy is a record of bonafide research work carried out by him under our guidance and supervision in conformity with the rules and regulations of Indian Institute of Technology, Delhi.

The research report and results presented in this thesis have not been submitted, in part or full, to any other university or institute for the award of any degree or diploma.

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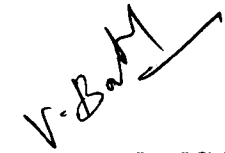

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ABSTRACT

In recent years, incorporation of internals in bubble columns has been reported to enhance the gas holdup and specific gas-liquid interfacial area. In this thesis, a method to achieve this objective successfully has been proposed via the use of vibrating helical spring internals.

Experimental observations on effect of vibrating internals such as vibrating helical springs on hydrodynamic parameters such as gas holdup, bubble size and mixing characteristics in bubble columns are presented. Effects of superficial gas velocity, static liquid column height to diameter (H/D) ratio, volume fraction of helical springs and thickness of the helical spring wires on hydrodynamics parameters are studied. Increase in gas holdup upto 135% is observed by using vibrating helical spring internals in bubble columns, as compared to bubble columns without internals. The estimated Sauter mean bubble size is around 3 mm, and enhancement of almost a factor of two is seen in specific gas-liquid interfacial area in bubble columns with vibrating helical spring internals, when compared to bubble column without internals. A gas holdup model is presented to rationalize the experimental data.

From the experimental data presented and analyzed, this thesis opens up possibilities regarding further investigations into the process intensification in bubble column reactors using vibrating internals.

TABLE OF CONTENTS