**335e A New Methodology for Scale-up of Bubble Column Reactors**

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Abstract

Bubble column reactors are two phase gas-liquid contactors that are widely used in chemical, petrochemical, and biochemical industries in various processes. Bubble column reactors are simple in construction but the task of extrapolating small diameter behavior to larger diameter one remains challenging and difficult due to complex interaction between phases.

Over the years, hydrodynamics of bubble columns has been quantified based on global hydrodynamic parameters such as overall gas holdup. Therefore, it is but obvious that the available scale-up methodologies for bubble columns are based on similarity of global parameters to maintain hydrodynamic similarity in two columns. With advances in measurement techniques, it is clear that two systems can have the same global hydrodynamics and still have different local hydrodynamic characteristics.

In this work, a new hypothesis has been proposed for hydrodynamic similarity of bubble column reactors. The main objective is to evaluate the proposed hypothesis for hydrodynamic similarity and subsequently for scale-up of bubble column reactors. The evaluation will be accomplished using advanced measurement techniques such as Computed Tomography (CT) and Computer Automated Radioactive Particle Tracking (CARPT). This methodology relies on the similarity of both global as well as local hydrodynamics to maintain similar performance in different column sizes and at different operating conditions. We will show in this presentation that, similarity based only on global parameter does not necessarily ensure the similar mixing and flow pattern in two systems and hence scale-up based on such hypothesis can be fatal. State-of-the-art correlations have been developed to facilitate the implementation of the developed scale-up methodology based on Artificial Neural Network (ANN) using a large databank of wide range of operating and design conditions for a priori prediction of hydrodynamic parameters to maintain such similarity.

In this presentation, the obtained results and findings will be discussed and analyzed in detail.