346g Two Fluid Models for Simulating Multiphase Reactions in Bubble Columns

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Bubble columns are widely used in the process industries for various reactions such as oxidation, halogenation, Fischer-Tropsch synthesis, column floatation etc. In many of these reactions mass transfer from the gas phase to the liquid phase is accompanied by a homogeneous reaction in the liquid phase. The overall conversion and the selectivity is determined to a large extent by the flow dynamics. The strong coupling that exists between the fluid mechanics, mass transfer, and reactions has made it very difficult for designing these reactors from a fundamental framework. Another very important problem in the design of these reactors is the issue of scale-up.

Advances in the physical modeling of bubble columns, availability of Computational Fluid Dynamics (CFD) software coupled with high speed computers enables one to take a look at these issues now from a more fundamental light. In this work we highlight how the Eulerian multiphase models can be used to model inter-phase mass transfer followed by a liquid phase reaction. Such a reaction scheme is very typical of many of reactions in bubble column reactors. Our work will highlight information that can be obtained from these simulations, and how CFD can be used effectively to enhance the performance of these reactors.