

454c Multiphase Reaction Network Synthesis by the Ideas Approach

Wen Zhou and Vasilios I. Manousiouthakis

Reaction Network Synthesis has been one of the focal points of Process System Engineering (PSE) area. Superstructure optimization and attainable region (AR) have been the main techniques to the synthesis of reaction networks. Recently a new approach -- Infinite DimEnsional State-space (IDEAS) was proposed and applied to such problems as AR construction and minimum volume (capital cost) problems. The advance of the IDEAS approach leads us to the research area which has seldom been explored before.

The most current reaction network synthesis work deals with one phase reaction, either pure liquid or gas phase. In this work, with the advantages of the IDEAS approach, we are going to apply to the multiphase reaction, where both gas and liquid phase exist. In the work, the temperature is assumed to be constant but the density will change along the reaction. The CSTR and PFR models will be represented and generalized. Indeed, from our previous work, we know the reactor models under constant or variable density condition can be generalized in mass fraction/flowrate terms. The process of mass transfer between the gas phase and liquid phase will be taken into account as well. Fluidized reactors, especially bubbling bed reactors within which the Denbigh reaction is carried on, will be investigated to illustrate the effectiveness of the proposed method.

Keywords: multiphase reaction, Reactor Network Synthesis, IDEAS