**Continuous crystallization to separate enantiomers exploiting two coupled fluidized bed crystallizers**

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Crystallization is one of the most effective ways to separate mixtures of enantiomers. Preferential Crystallization (PC) has proven to be applicable to provide selectively pure enantiomers from racemic mixtures of conglomerate forming systems [1]. Primarily batch processes are used so far. However, there are intensive efforts to develop continuous enantioselective crystallization processes [e.g. 2,3].

This contribution presents results of applying a fluidized bed crystallizer configuration for the continuous provision of enantiomers from a racemic feed solution. Objective is the supply of pure crystals with a defined narrow size distribution. To crystallize both enantiomers simultaneously two tubular fluidized bed crystallizers are coupled via their liquid phases. Saturated racemic solution is supplied at the bottom of the double jacketed crystallizers. To initiate the separation process seed crystals of both enantiomers are added. The growth of these crystals reduces the supersaturation of the processed liquid phases. The depleted mother liquors of both crystallizers are recycled via heated tubes into the feed tank. Thus, a racemic composition of the feed solution is maintained. A special feature of the process is the fact that the lower sections of both crystallizers are conical to offer the opportunity of classified product removal at certain heights [4]. This allows adjusting the mean product crystal sizes via the feed flowrate and provides narrow size distributions [5]. To ensure that the process operates continuously, larger particles and formed agglomerates are crushed in a mill. The fragments are returned as continuous seed streams. Undesired nuclei of the counter enantiomer and small particles leave the crystallizers with the fluid phases and are dissolved on the way back to the feed reservoir.

We will describe results of an interdisciplinary project devoted to solve three tasks. At first, the impact of important operating conditions (e.g. crystallization temperature and the various flowrates) is studied experimentally for two chiral systems. Secondly, the hydrodynamics of the two-phase flow are evaluated using Computational Fluid Dynamics (CFD) and the Discrete Element Method (DEM) [6, 7]. Further, in order to be able to optimize the crystallizer geometry and the operating conditions, a reduced process model based on population balances is developed exploiting Proper Orthogonal Decomposition (POD) [8,9].

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