

Feasibility of Heterogeneous Batch Distillation Processes

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Synthesis of heterogeneous batch distillation is discussed, which aims at splitting azeotropic mixtures by adding an entrainer partially miscible with one of the initial binary mixture components. Key operational parameters are identified such as the amount of entrainer added in the ternary feed, the reflux policy, and the vapor line position by examples. Synthesis and operation are less straightforward for heterogeneous batch distillation than those for the homogeneous case, but offer many advantages: more design alternatives, simplified distillation sequences, a lower consumption of entrainer, and a crossing of distillation boundaries by the still path. Feasibility is assessed using simplified modeling and confirmed using a commercial batch process simulator package. Synthesis expectations and simulated results are verified throughout bench-plant experiments for the separation of the acetonitrile - water mixture using acrylonitrile as a light heterogeneous entrainer.