CFD Modeling of Flow and Ion Exchange Kinetics in a Rotating Bed Reactor System - DTU Orbit (17/01/2019)

CFD Modeling of Flow and Ion Exchange Kinetics in a Rotating Bed Reactor System
A rotating bed reactor (RBR) has been modeled using computational fluid dynamics (CFD). The flow pattern in the RBR was investigated and the flow through the porous material in it was quantified. A simplified geometry representing the more complex RBR geometry was introduced and the simplified model was able to reproduce the main characteristics of the flow. Alternating reactor shapes were investigated, and it was concluded that the use of baffles has a very large impact on the flows through the porous material. The simulations suggested, therefore, that even faster reaction rates could be achieved by making the baffles deeper. Two-phase simulations were performed, which managed to reproduce the deflection of the gas–liquid interface in an unbaffled system. A chemical reaction was implemented in the model, describing the ion-exchange phenomena in the porous material using four different Sherwood number correlations. The simulations were overall in good agreement with experimental data.

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