

MIXING AND SEPARATION OF LIQUID-LIQUID TWO-PHASE IN A NOVEL CYCLONE REACTOR OF ISOBUTANE ALKYLATION CATALYZED BY IONIC LIQUID

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To improve the existing problems of the traditional isobutane alkylation catalyzed by ionic liquid reactors, a novel liquid-liquid cyclone reactor has been designed for the liquid-liquid heterogeneous reaction. Compared with the traditional hydrocyclone, the novel cyclone reactor consists of two inlets for light phase and heavy phase respectively. The light phase is injected into the reactor through two symmetric tangential slots in the inlet, while the heavy phase inlet is the axial entry with guide vane. The trajectory and residence time distribution (RTD) of the light phase could influence the reaction process and the products quality. In order to study the contact-mixing and separation mechanism of liquid-liquid in the novel cyclone reactor, the trajectory and residence time distribution in the reactor were investigated. The simulation using species transport equation and experiment were performed under oil-water system. The tangential and radial dispersion process of oil was observed in the simulation. The simulation results show that the mean residence time of the oil is between 0.6s~1.0s under different operating parameters. The oil flow in the reactor is not a smooth flow or a complete mixing flow judging from the dimensionless variance. The separation efficiency in simulated method was higher than 99%. The volume fraction of water in the overflow mixture was lower than 5%. And the deviation between the simulated and experimental results was no more than 5%, which indicates that the simulated results are reliable and accurate.