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CFD prediction of water-oil two-phase flow in stirred tanks

YIN Hong

Zhejiang University, China

CFD simulations were used to investigate the mixing quality for water-oil two-phase flow in stirred tanks. Effects of impeller speed (N), dispersed phase volume fraction α, continuous phase viscosity μ_c, density of two phase ρ, impeller clearance C and diameter D on the mean droplet size (d32), specific surface area (S/V) and droplet size distribution (DSD)were studied by discrete method based on PBM model describing the breakage and coalescence for dispersed phase, MRF technique modeling the impeller rotation, k-ε model based on Euler-Euler approach modeling the turbulent flow.For system of water dispersed in continuous oil phase, increasing N and μc are both beneficial to the dispersion of water phase, which lead to decreases in d32 and S/V. The DSD based on number were found to have bimodal distribution, while the DSD based on volume were unimodal distribution all the time. As α increases, both d32 and S/V increase and DSD based on number begins to change to larger size within a narrow range. The change of DSD based on volume is more significant, which can better reflect the change of the size of the dispersed phase. For system of oil dispersed in continuous water phase, effects of α and μ_c were similar to that for water dispersed system. Beside, d32 and S/V decrease with increasing density difference between two phases. C and D significantly influence the flow pattern, which would directly affect the mixing.

Biography

YIN Hong is an associate professor in chemical engineering and applied chemistry at Zhejiang University. She has published more than 120 papers in reputed journals and has more than 30 authorized patents. She is the winner of National Second Prize of Technology Innovation and National Excellent Prize of Patent.

yinh@zju.edu

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