Droplet generation in round microchannels with a Double T Junction : a computational fluid dynamics simulation = Pembuatan droplet dalam saluran mikro lingkar dengan persimpangan T Ganda : simulasi dinamika fluida komputasi

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Abstrak

Penggunaan mikofluida dapat meningkatkan proses pembentukan droplet sekaligus mengurangi konsumsi energi. Dalam penelitian ini, sistem mikroreaktor dengan sambungan T ganda dan reaktor saluran pipa mikro sepanjang 830 mm dianalisis. Aliran itu terdiri dari stirena dan air. Konsentrasi air dalam emulsi dan laju aliran air dan stirena dievaluasi. Tetesan diamati pada rasio laju aliran stirena terhadap air mulai dari 1:5 hingga 1:50. Simulasi di persimpangan T ganda dilakukan dengan aliran laminar dan model Volume Of Fluids dipilih untuk interaksi fase. Percobaan dengan sembilan laju aliran stirena dan air dilakukan. Sistem optik sederhana digunakan untuk pengamatan in-line dari tetesan yang terbentuk di mikroreaktor. Untuk flow ratio 1:5, tidak terjadi pembentukan drop. Untuk laju lainnya, ukuran tetesan diamati berdiameter dari 8 hingga 41 m. Tetesan bergerak sepanjang reaktor mempertahankan bentuk dan ukuran. Hal tersebut menunjukkan bahwa sistem reaksi mikro cocok untuk mengembangkan sistem yang membutuhkan stabilitas, seperti polimerisasi emulsi. Perbandingan antara model dan hasil eksperimen menunjukkan bahwa ini cukup terwakili oleh model.

.....The creation of droplets may be enhanced while using less energy by using microfluidics. The current study examined a microreactor system with a double T junction and an 830 mm-long circular microchannel reactor. Water and styrene made up the stream. Water and styrene flow rates as well as the volume percent of water in the emulsion were assessed. Styrene to water flow rate ratios between 1:5 and 1:50 produced droplets. The Volume Of Fluids model was utilized for the phase interactions during the simulations of the double T junction, which were conducted with laminar flow. Calculations were made for nine different styrene and water flow rates. Droplets created in the microreactor were seen in-line using a data-generated point and line. There were no drops formed at a flow ratio of 1:5. Droplets between 8 and 41 m were seen at the other rates. While moving through the reactor, the droplets kept their size and form. This proves that the micro reaction system is appropriate for creating stable systems, including emulsion polymerizations. The comparison of model and experimental data revealed that the model well captured these findings.