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EXPERIMENTAL INVESTIGATION AND CFD SIMULATION OF THE HYDRODYNAMIC AND MASS TRANSFER CHARACTERISTICS IN A SPLIT-CYLINDER AIRLIFT REACTOR CONTAINING PETROLEUM-WATER MICRO-EMULSIONS

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Abstract

In this article, hydrodynamic parameters and overall Oxygen mass transfer coefficient of petroleum based micro-emulsions in an airlift reactor were investigated. Four different petroleum-in-water micro-emulsion systems containing kerosene, heavy naphtha, light naphtha and diesel as oil based were used with concentrations of 3% and 7 % (v/v). The experimental data were supported by simulation results obtained from the Computational Fluid Dynamics (CFD) method. The CFD was properly able to simulate hydrodynamics and mass transfer in a bubbly flow. The experimental and CFD results showed that although gas holdup increased when the oil in water ratio was increased, liquid circulation velocity and Oxygen transfer coefficient decreased. Furthermore, the suitable correlations based on dimensionless numbers for gas holdup and volumetric mass transfer coefficient was obtained. A good agreement between experimental data, CFD results and correlated data was observed.

Key words: airlift reactor, CFD, hydrodynamics, micro-emulsion, volumetric mass transfer

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