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TREATMENT OF BIODIESEL WASTEWATER BY SOLVENT EXTRACTION: EVALUATION OF THE KINETIC AND THERMODYNAMIC DATA

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Abstract

Transesterification is one of the main biodiesel production method that produces huge amount of wastewater due to the high organic substance content (COD =300000-400000 mg/L, oil and grease= 17000-25000 mg/L). Although there are several treatment methods, flotation is the current conventional treatment method for oil and grease (O&G) before the biological treatment. In this study solvent extraction method was developed for pre-refining of biodiesel wastewaters. For the solvent extraction method, hexane and tertiary methyl butyl ether (TMBE) were determined as the most efficient solvents for the extraction of O&G. In this work, extraction kinetics and extraction thermodynamics were investigated for COD and O&G. The effect of solution pH and solvent ratio were investigated onto the solvent extraction process to optimize the developed method. The experimental results show that extraction method effectively removes the COD and O&G by 99.0% at pH 2 for both solvents. Experimental results also showed that depending on free energy change COD removal efficiency of hexane is higher than TMBE. COD extraction kinetics perfectly fits to the pseudo-second order kinetics. The necessary solvent/water ratio was found as 1/1 volume ratio for both solvents. The experimental results show that hexane extraction could effectively remove the COD, O&G and TOC by 96.0%, 99.8% and 91.0%, respectively, at the optimized conditions of pH 2.0, 1/1 solvent-water ratio and 30 min extraction time.

Key words: biodiesel wastewater, extraction, kinetic, thermodynamic, treatment

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