



UNIVERSITI  
TEKNOLOGI  
MARA

# THE DOCTORAL RESEARCH ABSTRACTS

Volume: 10, Issue 10 October 2016

TENTH  
ISSUE

INSTITUTE of GRADUATE STUDIES

IGS Biannual Publication



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**Title :** REACTIVE DYES REMOVAL USING PLANT-BASED SURFACTANT IN MICELLAR-ENHANCED MICROFILTRATION (MEMF)

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Textile industry has grown to become one of the important industries in Malaysia. Reactive dyes are extensively used in textile industry since these dyes are being recognized as the best dyes used for dyeing cotton and cellulosic fiber. However, reactive dyes have low fixation rate and therefore facing the highest loss in dyeing process. Most of these dyes have complex structures that resist degradation in conventional wastewater treatment process. Due to these factors, it is an urgent need to find a way to preserve the environment while keeping the economic growing. In this study, the removal of C.I Reactive Black 5 (RB5) and C.I Reactive Orange 16 using plant based esterquat surfactant (PBE and VBE) via micellar-enhanced microfiltration (MEMF) was investigated. FTIR confirms the existence of functional group and interaction occurred between dyes and esterquat surfactant. The Critical Micelle Concentration of PBE and VBE surfactant obtained was at range of 93 to 97 mg/L and 152 to 159 mg/L via conductivity method and UV-Vis spectrophotometric method. It is verified that the developed simplified method for analysis of surfactant concentration is in a good agreement with the existing colourimetric method. The micelles was formed in vesicle arrangement with particle diameter at size range from 140 to 1500 nm. The MEMF process was performed by using hydrophilic mixed cellulose esters microfiltration membrane (MCE) with pore size of

0.45  $\mu\text{m}$ . Results obtained in MEMF study using PBE and VBE surfactant shows almost complete decolourization of RB5 and RO16 and confirms the existence of competitive binding interaction between RB5 and RO16. The best operating condition obtained for MEMF was achieved at surfactant concentration of 2CMC, pressure of 150 kPa, stirring speed of 200 rpm and initial pH of 5.5 (unadjusted pH). Treatment of actual wastewater for source 1 via combined coagulation/flocculation process and MEMF process shows final treated wastewater achieved more than 80% removal of colour, COD, suspended solid(SS) and turbidity using PBE surfactant, however for VBE surfactant only the colour and COD achieved more than 80%. It is proved that MEMF using biodegradable plant based esterquat has a great potential to become a new green technology for removing reactive dyes from textile wastewater. The overall percentage error for resistances and permeate flux obtained in Resistance in series (RS) model is within  $\pm 20\%$ , indicating that all the experimental data were close to RS model data. Therefore this study proved that Resistance-in-series (RS) model is useful in predicting and quantifying the flux decline and resistance occurred in MEMF process.