

**PHOTOCATALYTIC DEGRADATION OF OILY WASTEWATER:
EFFECT OF CATALYST CONCENTRATION LOAD, IRRADIATION TIME
AND TEMPERATURE**

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**A thesis submitted in fulfillment
of the requirements for the award of the degree of
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I declare that this thesis entitled “Photocatalytic Degradation of Oily Wastewater: Effect of Catalyst Concentration Load, Irradiation Time and Temperature” is the result of my own research except as cited in references. The thesis has not been accepted for any degree and is not concurrently submitted in candidature of any other degree.”

Signature :.....

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Date : 2 May 2009

Special Dedication of This Grateful Feeling to My...

***Beloved father and mother;
Mr. Mok Bin Saliman and Mrs. Roslinda Bt Katan***

***Loving brothers;
Khairul Azahari and Kamarul Azizi***

***Supportive families;
Uncles and Aunties***

For Their Love, Support and Best Wishes.

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ABSTRACT

The photocatalytic degradation of an oily wastewater over titanium dioxide, TiO₂ suspensions was investigated. The study focused on the effects of various operating parameters on the treatment efficiency which include catalyst concentration load, irradiation time and reaction temperature. Catalyst concentration load was studied in the range 0.5-2.5 g/L, irradiation time between 0-150 min and the reaction temperature in the range 30-60 °C. The regression and graphical analysis with statistical significance for this researched were done using Design Expert 7 software. In order to visualize the relationship between the experimental variables and responses, the response surface was generated from the model. Treatment efficiency, which was expressed in terms of chemical oxygen demand (COD), generally increased with decreasing initial COD. Higher treatment efficiency involved the increasing of irradiation time with temperature. The percent of degradation nearly achieved 51% depending on the conditions employed. The optimum conditions for this research work can be acquired at catalyst concentration of 0.5 g/L while the effect of temperature and reaction time were conducted at 60 °C and 150 min respectively.

ABSTRAK

Degradasi cahaya bermangkin ke atas air buangan berminyak bergantung kepada titanium dioxide katalis telah dijalankan. Kajian ini tertumpu pada kesan pelbagai operasi parameter ke atas efisiensi rawatan air buangan termasuk kadar katalis yang digunakan, masa penyinaran dan juga suhu tindak balas. Kadar pemangkin yang telah dikaji adalah di dalam lingkungan 0.5-2.5 g/L, masa penyinaran diantara 0-150 minit dan suhu tindak balas dalam lingkungan 30-60 °C. Regresi dan analisa grafik dengan signifikasi statistik di dalam kajian ini telah dilakukan dengan menggunakan “Design Expert 7 software”. Untuk menggambarkan hubungan di antara faktor dan reaksi eksperimen, reaksi permukaan telah terhasil daripada model tersebut. Efisiensi rawatan air buangan, yang mana dinyatakan dalam istilah “COD”, biasanya meningkat dengan penurunan nilai COD asal. Efisiensi rawatan air buangan yang tinggi melibatkan pertambahan masa penyinaran bersama pertambahan suhu tindak balas. Peratus penguraian yang dicapai dalam kajian ini hampir 51% bergantung kepada keadaan dimana tindak balas dijalankan. Keadaan yang maksimum diperolehi untuk mencapai peratus penguraian yang tertinggi di dalam kajian ini adalah pada 0.5 g/L kadar katalis sementara suhu tindak balas dan masa penyinaran dijalankan pada 60 °C dan 150 minit berturut-turut.

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