Removal of Para-nitrophenol from Industrial Waste Water (IWW) by Adsorption using Modified Activated Carbon

by

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Dissertation submitted in partial fulfillment of
the requirements of the
Bachelor of Engineering (Hons)
(Chemical Engineering)

MAY 2011

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CERTIFICATION OF APPROVAL

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Approved by,

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CERTIFICATION OF ORIGINALITY

This is to certify that I am responsible for the work submitted in this project, that the original work is my own except as specified in the references and acknowledgements, and that the original work contained herein have not been undertaken or done by unspecified sources or persons.

GOH HUI SAN

ABSTRACT

Para-nitrophenol is one of the organic pollutants found in industrial wastewater treatment. Its toxicity can bring great harm to biological systems, including plants, fish and other organisms. Besides, para-nitrophenol will defect resins when entering the ion exchange unit in Condensate Polishing Plant (one part of the wastewater treatment system). Therefore, activated carbon used in the carbon filter installed before the ion exchange unit has to be modified to overcome the resin life problems as a result of fouling due to the organic compounds by adsorbing the organic pollutants more efficiently. For this research, surface modification of activated carbon using acidic solution is applied. The effect of adsorbate concentration, pH and temperature on the adsorption capacity for both unmodified and modified activated carbon are observed as well as analyzed. Scanning Electron Microscope (SEM) is used to study the pore structure of the activated carbon before and after modification, whereas UV-vis Spectrophotometer is used to determine the adsorption capacity of the activated carbon towards organic pollutant. As the concentration of absorbate increases, adsorption capacity increases. The adsorption reaches its highest point around pH 7. When the carbonization temperature increases, the adsorption capacity increases as well.

ACKNOWLEDGEMENTS

First and foremost, I would like to express my sincere gratitude to my supervisor, Dr. Usama Mohamed Nour El Demerdash for his valuable guidance throughout this project. Without his advices and supports, the accomplishment of this project would be impossible. Besides that, I would also wish to thank all the internal examiners, including AP Dr. Thanabalan Murugesan (seminar in Final Year Project I), AP Dr. Khashayar Nasrifar (final presentation in Final Year Project I) and also AP Dr. Azmi B Mohd Shariff (poster presentation in Final Year Project II) for their helpful and constructive feedbacks and suggestions given. Not forgetting special thanks to Mr. Asnizam and Mr. Jailani for giving me various technical supports as lab technicians. They have been helping a lot in providing laboratory workspace, equipment and technical assistance as well. In addition, I would also wish to record my thanks to all my friends and coursemates who have assisted in the project either directly or indirectly throughout the whole Final Year Project period. Last but not least, I would like to thank the Final Year Project Committee for their great work in coordinating the final year project.

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ABBREVIATIONS AND NOMENCLATURES

AC	Activated Carbon
CAC	Clean Activated Carbon
FTIR	Fourier Transform Infrared Spectroscopy
GAC	Granular Activated Carbon
HCl	Hydrochloric Acid
HNO_3	Nitric Acid
MAC	Modified Activated Carbon
NaOH	Sodium Hydroxide
SEM	Scanning Electron Microscope
US EPA	United States Environmental Protection Agency
VOC	Volatile Organic Compound