UNIVERSITI TEKNOLOGI MARA

CATIONIC SURFACTANT IMPREGNATED ACTIVATED CARBON FOR ADSORPTION OF REACTIVE DYE

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Bachelor of Engineering (Hons.)
Chemical

JULY 2017

ABSTRACT

Textile industry is one of the biggest users of water that produce waste consists of complex chemicals structure including dye during various processing stages. Reactive Blue 4 is one of the reactive dye that released by this industry. Research work was directed to determine the optimum condition in the removal of RB4 dye. Hence, the RB4 pollutant was treated by adsorption process with activated carbon impregnated with cationic surfactant. The adsorption performance of AC-Cationic Surfactant was investigated by studying parameters that effecting the efficiency of removal of reactive dye, RB4 from aqueous solution that were surfactant loading impregnated with AC, temperature and pH of initial solutions. Cationic surfactant greatly increased AC adsorption capacity for RB4 with 67.25% of removal in 5 hours in acidic pH range 5.0-5.9 at 50°C temperature by direct method while by indirect method, the removal achieved 71.25% of RB4 removal in 7 hours in acidic pH of initial solution at 30°C. It was observed that adsorption of RB4 dye was greatly enhanced by modification of AC with cationic surfactant impregnated by indirect method compared to direct method.

Keywords: Activated Carbon, Adsorption process, Cationic surfactant, plant-based surfactant and Reactive dye.

ACKNOWLEDGEMENT

Alhamdulillah, all praised to Allah the Al-Mighty.

My first and sincere appreciation goes to Dr. Siti Wahidah Binti Puasa, my research project supervisor for giving me the opportunity to explore the field of chemical engineering science and let me work under her surveillance group at Universiti Teknologi MARA Shah Alam. I would also like to express my deep gratitude and respect for her valuable advices, motivation and guidance that have significantly helping me to successfully complete this final year research project.

I would like to thank all the lab assistants, Mr. Mohd Yazid Bin Yusof, Mr. Mohd Nazmi Bin Mohd Mukelas, Madam Azizan Binti Din, Madam Rohaida Binti Zainordin and Madam Nor Suhaila Sabli for all the supports concerning my undergraduate affairs.

In my daily work I have been blessed with a friendly and cheerful group of my research teammates, Nadzarul Azwan Azhari and Muhamad Azran Zaidill Bin Azizan. I would like to thank them for being a great reliable person to whom I could always discuss on challenges and excitements regarding progression of the research study. Thanks for questioning me about the ideas, helping me think rationally and for a great teamwork.

Last but not least, I am also grateful to my parents, Ahmad Khairi Bin Shafie and Madam for their love and encouragement that keeps me breathe, and motivated.

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INTRODUCTION

1.0 WATER POLLUTION

Water is the most important needs in this world for every living thing. Recently, water becomes contaminant with many substances and chemicals that can be dangerous for survival of human, plants and animals. The existence of water pollution is mainly generated directly by industrial activities such as textile industry, waste treatment plant, and factories. Besides that, the soils and groundwater also contaminated with improper disposal technique by industrial wastes. In order to have a clean and safe water resource to use, the polluted water must be converted to its original state and conditions. Therefore, full attention and concern about this issue of water pollution should be highlighted by everyone in a way to give a good impact and improvement on world ecology.

1.1 WASTE WATER FROM TEXTILE INDUSTRY

Water pollution was hugely generated by industrial activities. One of the industries that discharged a large amount of waste water is textile industry. One of the dyes generated from textile industry is reactive dye. In this study, Reactive Blue 4, RB4, $C_{23}H_{14}C_{l2}N_6O_8S_2$ is the most common dyes that usually used as the material in the production for dyeing industry due to its properties of bright colour, excellent colourfastness and convenient to be in application (El et al., 2016). However, RB4 reported as a caused in environmental problem (Polyporus et al., 2012). Effluent from this dye leads to health problem to human in terms of mutagenic, carcinogenic and may cause severe damage to human beings such as irritation to the gastrointestinal tract with symptoms of nausea, vomiting and diarrhoea as well as impact to the aquatic life in terms of toxicity (Malarvizhi & Ho, 2010).

Therefore, RB4 dye that very toxic and hazardous from textile industry needs to be treated to ensure it is safe to use for other purposes. Treatment of RB4 dye need to be done due to wastewater contribution of high value of suspended solids,