

UNIVERSITI TEKNOLOGI MARA

**COD REDUCTION OF
ELECTROPLATING WASTEWATER
USING ACTIVATED CARBON
PREPARED FROM SUGARCANE
BAGASSE**

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ABSTRACT

Commercially prepared activated carbon can be very expensive, thus, research on low cost adsorbents are vastly studied especially by using waste as the raw materials. In this study, sugarcane bagasse is the raw materials chosen as the precursor in preparing activated carbon. In wastewater treatment industry, activated carbon (AC) is a very common adsorbent used due to the highly porosity and large surface area and the application of activated carbon in reduction of chemical oxygen demand (COD) through carbon adsorption is a common type of treatment. COD parameter is important in determining the amount of contaminants in the wastewater as it evaluated the overall adsorption behavior. The aim of this study is to prepare and characterize the sugarcane bagasse activated carbon (SBAC) using physiochemical activation method where both chemical and physical activation are both performed for the activation step. The characterization analysis is conducted, focusing on the pore structure of SBAC by Thermogravimetric Analysis (TGA), Fourier Transform Infrared Analysis (FTIR) and Brunauer- Emmett- Teller (BET). For TGA, rapid weight loss for the activated carbon happened starting the temperature 35 °C until 130 °C and comparing to other samples, sugarcane bagasse activated carbon has the least thermal stability. For FTIR analysis, the activated carbon showed four peaks indicating the existence of free and intermolecular bonded (O-H) group, C-H stretching and bending and C=O group. The SBAC also poses high BET surface area and pore volume. The second objective is to reduce COD value in electroplating wastewater by varying the contact time and the adsorbent dosage in a batch adsorption study. The experiment is conducted with time and adsorbent dosage as the manipulative variables. From the findings, the highest COD percentage removal achieved is 91% with 10 g of adsorbent per 100 mL of water sample, with 240 rpm mixing speed and 1 hour contact time.

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CHAPTER ONE

INTRODUCTION

1.1 Research Background

These days, more people have reached to the awareness that waste materials can contribute a lot in pursuing sustainable lifestyle. From recycling papers and glasses to incorporating big- scale of waste from industries, all of these efforts are surely needed in order to promote sustainable and energy- saving lifestyles.

Nowadays, agricultural by- products have been evoking the interest due to their renewability, low cost and wide prevalence to produce activated carbon (Lua & Yang, 2005). Agricultural by- products mostly consists of lignin, cellulose and hemi-cellulose. Other than that, they also contain some proteins that make them a very potent adsorbents (Cronje, Chetty, Carsky, Sahu, & Meikap, 2011). The studies on preparing activated carbon using agricultural by- products have been done vastly. Some of the agricultural by- products that have been used includes bamboo (Ahmad & Hameed, 2010; Q.-S. Liu, Zheng, Wang, & Guo, 2010), sugarcane bagasse and rice husk (Foo, Lee, & Hameed, 2013; Garg, Kaur, Garg, & Sud, 2007; Kalderis, Bethanis, Paraskeva, & Diamadopoulos, 2008; Dimitrios Kalderis et al., 2008), corncobs (Garg et al., 2007), coconut shells (Yang et al., 2010), apricot stone (Kobyas, Demirbas, Senturk, & Ince, 2005), Paulownia wood (Yorgun, Vural, & Demiral, 2009) and many more.

In this study, sugarcane bagasse is the raw materials chosen as the precursor in preparing activated carbon. Sugarcane is one of the herb's species that belongs to the grass family where it is officially classified as *Saccharum officinarum*. Sugarcane comes from family of Gramineae (Parameswaran, 2009). According to Parameswaran, some of the uses of sugarcane includes sugar production, Falernum, molasses, rum, soda and fuel (ethanol) (Parameswaran, 2009). As mentioned by Liu, Basnayake et al., 75% of sugarcane is used to produce sugar in sugar industry (J. Liu et al., 2016). In sugar production industry, the by- products are bagasse, filter cake and molasses