

**KINETIC ADSORPTION MODELING OF ZINC ONTO HYDROGEL
BIOCHAR**

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ABSTRACT

Biochar is produced by pyrolysis process under certain temperature and pressure. Previous study shows that the potential of hydrogel biochar from rice husk to adsorb heavy metal like zinc in the wastewater. therefore, this study focus on the potential of the hydrogel biochar from palm kernel shell and fly ash coal which can be applied in wastewater treatment in zinc removal through adsorption method. To understand how sorption of Zinc onto hydrogel biochar, the common isotherms study is required to identify the mechanism, capacity adsorption for the first objective and next objective is the rate of sorption that determined by pseudo kinetic reaction which are mainly, first order, second order and intra-particle diffusion. Three isotherm are chosen as they regularly use which are Langmuir, Freundlich and Temkin. Best isotherm is determined by R^2 by taking the highest value. Based on the result, this adsorption of Zinc onto hydrogel biochar (palm kernel shell and fly ash coal) are more favor to Freundlich isotherms ($R^2=0.9991$) compare Temkin ($R^2=0.8923-0.8272$) of second best fit and Langmuir ($R^2=0.885$) for last isotherm. Besides that this adsorption is likely to be pseudo second order ($R^2=0.999$) compare to the pseudo first order ($R^2=0.915-0.641$).

Keywords— kinetic pseudo order, hydrogel biochar palm kernel shell, isotherm, kinetic modelling,

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CHAPTER ONE

INTRODUCTION

1.1 Research Background

When world economic starts to grow. The demand of production also start increase. To fulfil the demand, the industries sector begin expand and increases. Therefore, it is good news for industry since the profits can made through high demand of product. However, we need to pay a price for the development of industry and human activities that generate large amount of environmental pollution. One of them is water pollution caused by heavy metal dissolved in water in high concentration that does not dispose properly. Unlike organic compound the inorganic compound susceptible to biological degradation, heavy metals will not degrade into harmless end products. So the removal of zinc is necessary to protect the future environment.

The study of the adsorption Zn onto hydrogel biochar relates close to the performance of the Industrial Effluent Treatment System (IETS) in physical chemical process (PCP). Most waste products from industry usually consist of heavy metal especially like industry of pigment and dyes, rubber product, paint and so on. Therefore, abundant waste of zinc may create large problem to remove this heavy metal since it relates to the cost, space and time consuming. To solve them, many researches and studies of the removal heavy metal in the waste water treatment has been carry out to improve and reduce the operating and capital cost. Heavy metal like zinc is inorganic compound and non-biodegradable compound. the excess of zinc in water can lead serious problem. As engineers, of course, they now focus on the low cost material to remove the excess zinc.

Nowadays, the biorefinery is becomes major branch in business due to the abundant of the biomass from waste which can reused and reprocessed to be useful product rather than dispose since that biomass can be value added and give a profit to industry and develop new application or method like leaching process. Malaysia has largest palm tree plantation and the waste is so abundant which can be process to added value. Palm kernel shell example can undergoing pyrolysis process to become