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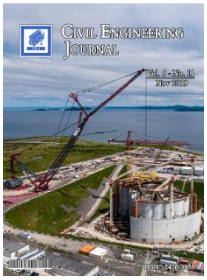

Study of Biomass Bottom Ash Efficiency as Phosphate Sorbent Material

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Abstract

Excessive richness of nutrients in water bodies such as rivers, lakes and ponds lead into deterioration of aquatic life as a results of dense growth of algae. Phosphate is one of the main nutrients that should be controlled to prevent this serious issue. Utilizing low cost material as a phosphate sorbent is offering a treatment method characterized as a sustainable solution. In this study the efficiency of biomass bottom ash BBA as phosphate sorbent material from aqueous solution is investigated. Batch experiments were undertaken, in which a particular mass of BBA was brought into contact with the phosphate solution. The experiments studied the influence of pH (different phosphate solutions were prepared with pH range 4 to 8), temperature (adsorption capacity measured at the temperature range of 10 to 30 °C), and contact time. In addition, the adsorption isotherm models were also applied to better understand the mechanism of phosphate sorption by BBA. The results revealed that the bonding between the cations (BBA surface) and anions (phosphate solution) is significantly affected by the pH of the solution. BBA presents an excellent phosphate sorption, especially, at low pH value and temperature around 20 °C. The method of this research can be adopted as a followed strategy for examination the capability of selected material for phosphorus removal from wastewater.

Keywords: Adsorption Isotherm Models; Biomass Bottom Ash; Filter Media; pH; Phosphate Sorption; Wastewater Treatment.

1. Introduction

Phosphorus is one of the essential nutrients that contribute in eutrophication the water bodies such rivers and lakes [1, 2]. Eutrophication or also called algal blooms is the process of extraordinary growth of the algal as a results of nutrients release into the water bodies. The Eutrophication play a negative role by preventing the sunlight from reaching the aquatic vegetation; and decrease the dissolved oxygen as a result of decomposition of their organic matter that lead to present of adverse effects on the aquatic life. The diversity of the higher forms of the aquatic life will be reduced because of the poor conditions of the water system that caused by eutrophication such as anoxic, acidic, detrimental conditions [3]. Recently, many regulations were enacted to protect the water bodies from the nutrients; specifically, the phosphorus. Water Framework Directive (WFD) which is legislated by European Union EU is one of these regulations that tightening the nutrient discharge into water bodies [4]. All over the world, a significant attention was paid to prevent the effluent of nutrients into the ecosystems to avoid their adverse effects. Therefore, seeking for new techniques to control the nutrients concentrations became significantly required.

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