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Research Article

Effect of NaOH Treated Oil Palm Empty Fruit Bunch (OPEFB) on Adsorption of Cd (II) Under Acidic Condition

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Abstract

Adsorption is an effective way of extracting heavy metal ions from aqueous solutions. Alkali treatment is a chemical modification method that is influenced by concentration and time. The study aims to investigate the effect of NaOH treatment of OPEFB on Cd (II) adsorption under acidic condition. The alkali treatment was done by varying the concentration of NaOH (0.1 M, 0.5 M, and 1.0 M) and the immersion time (12 h and 24 h). SEM images confirmed the existence of pores on the treated OPEFB in comparison with the raw OPEFB. Characterization of treated adsorbent using FTIR resulted in a change of functional groups peak's position such as hydroxyl and carboxyl groups after the alkali treatment, which might involve Cd (II) adsorption. OPEFB treated with 1.0 M NaOH and 24 h immersion time showed the highest Cd (II) removal under acidic condition (pH 4). All the NaOH treated OPEFB showed an increment in adsorption efficiencies compared to raw OPEFB, suggesting that this treated biomass has a potential for application as an adsorbent for the removal of Cd (II) from wastewater

Keywords: Adsorbent, adsorption, cadmium, oil palm empty fruit bunch.

Introduction

As the industry is one of the largest consumers of water, it is necessary to treat wastewater to an appropriate standard before discharging it into waterways or reusing it for a variety of beneficial purposes, and hence, water conservation can also be achieved. In worldwide, over 80% of all wastewater returns to the environment without being treated [1]. An estimated 1.2 million people died as a result of unsafe water sources in 2017. This was 2.2% of global deaths [2]. More than 2 billion people live in countries experiencing high water stress due to the lack of freshwater resources to meet the standard water demand [1].

Cadmium is a non-biodegradable, toxic heavy metal that tends to accumulate in living organisms. The community needs to be aware of the cadmium pollution surrounds them as the cadmium has the chronic potential to cause kidney, liver, bone, and blood damage for long-term effects [3]. About 82% of cadmium consumption was contributed by batteries application, followed by 10% from pigments application, 6% from plating application, 1.5% from stabilizers in polymers application, and 0.5% from the other applications [4]. Due