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# Preparation of chitosan composite film reinforced with cellulose isolated from oil palm empty fruit bunch and application in cadmium ions removal from aqueous solutions

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## Highlights

- Chitosan was reinforced with cellulose isolated from oil palm empty fruit bunch
- Addition of cellulose enhanced the mechanical properties and adsorption capacity of chitosan film
- Chitosan/cellulose composite film has a high adsorption capacity of Cd<sup>2+</sup> ions

## Abstract

Chitosan composite films reinforced with cellulose isolated from oil palm empty fruit bunch had been successfully prepared and applied in cadmium ions removal from aqueous solutions. Cellulose particles were isolated by hydrolyzing oil palm empty fruit bunch with hydrochloric acid. Several compositions were prepared by varying the chitosan/cellulose ratio of composites. The structure and the properties of composites were investigated by Fourier transformed infrared spectroscopy (FTIR), X-ray diffraction (XRD) and mechanical performance measurement. FTIR spectra confirmed that cellulose particles were incorporated into the chitosan matrix. Tensile test results showed that the contents of chitosan and cellulose influenced the mechanical properties of composites. The composite with 10wt% cellulose particles had the highest tensile strength. The X-ray diffraction patterns indicate the crystallinity index of composites decreased with addition of cellulose particles. This low crystallinity is important for metal ions removal in water treatment. Application of composite for cadmium removal from aqueous solutions was done by various solution pH, contact time and concentrations. The adsorption isotherm of Cd ions onto the composite was well fitted to Langmuir equation. The pseudo second-order model could describe adsorption process better than pseudo first order model. Furthermore, the adsorbent still exhibited good adsorption performance after regeneration.

**Keywords:** chitosan, cellulose, cadmium, composite, adsorption.

## 1. INTRODUCTION

Heavy metal ions pollution has become the most urgent environmental problem because its hazardous to humans and the surrounding environment. Cadmium ion (Cd<sup>2+</sup>), which is very

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