

**SELECTIVE REMOVAL AND RECOVERY OF
GOLD AND COPPER IONS FROM AQUEOUS
SOLUTION BY PKFAD-IMPREGNATED
CHITOSAN**

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AUTHOR'S DECLARATION

I declare that the work in the thesis was carried out in accordance with the regulation of Universiti Teknologi MARA. It is original and is the results of my own, unless otherwise indicated or acknowledge as reference work.

I, hereby acknowledge that I have been supplied with the Academic Rules and Regulations, Universiti Teknologi MARA, regulating the conduct of my study and research.



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SUPERVISOR'S CERTIFICATION

We declared that we read this thesis and in our point of view this thesis is qualified in terms of scope and quality for the purpose of awarding the Bachelor of Chemical Engineering (Environment) with Honours.



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ABSTRACT

Chitosan is one of the developing biosorbent that becomes main interest among the researchers since it can be used to recover various types of heavy metals in the aqueous solution. A lot of physical and chemical modifications had been done toward the chitosan in order to increase its effectiveness for heavy metals recovery. In this research, the recovery of gold and copper ions from the aqueous solution has been investigated by using PKFAD-impregnated chitosan as biosorbent, since there is no research had been conducted for this new biosorbent. It is necessary to be conducted since the conventional method like solvent extraction bring more negative impact to the environment. The objectives of this research are to investigate the effects of different parameters on the selective sorption of gold and copper from aqueous solution by PKFAD-impregnated chitosan and to propose suitable desorbing agents for gold and copper recovery from PKFAD-impregnated chitosan by literature review. To synthesis the PKFAD-Chitosan beads, the raw chitosan needs to be dissolved with 3% acetic acid before mixed with the PKFAD. The formation of the beads can be done by dropping the mixture solution wisely into the methanol/ammonia solution. The investigated parameters for gold and copper ions recovery are pH of the aqueous solution, initial ratio concentration of aqueous solution and biosorbent dosage. Based on the result obtained, the highest percentage adsorption of Au(III) and Cu(II) can be achieved at pH = 3.24 (96.9%) and pH = 5.53 (71.1%) respectively. When the pH is increasing, the selectivity of Au(III) over Cu(II) reduced from 28.772 to 0.328. For the initial ratio concentration, it can be observed that the adsorption capacity of gold increasing from 6.66 mg/g to 30.719 mg/g with the initial ratio Au(III):Cu(II) from 1:1 to 5:1. However, the selectivity of Au(III)/Cu(II) is much lower compared to Cu(II)/Au(III) even though the concentration of Au(III) is five times higher than Cu(II). For the adsorbent dosage, the adsorption capacity were decreased for both Au(III) (13.29 mg/g to 3.94 mg/g) and Cu(II) (12.59 mg/g to 2.53 mg/g). The selectivity of gold over copper start to surpass at the adsorbent dosage 0.16 g. For the desorption process, the combination of eluents, thiourea and HCl is highly potential to recover Au(III) from PKFAD-Chitosan beads. Meanwhile, the recovery of copper can be done by using HCl, HNO₃ and EDTA that act as the eluents.