

## SIIC02

# MULTIELEMENT EXTRACTION FROM AQUEOUS SOLUTIONS BY PALM KERNEL FATTY ACID DISTILLATE

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### **Abstract:**

Palm kernel fatty acid distillate (PKFAD) was investigated into its potentiality as green extractant for Cu(II), Ni(II), Co(II), Mn(II) and Au(III) extraction from aqueous solutions. The pH-extraction isotherms of various elements by PKFAD were studied at a constant O:A ratio of 1:1. The separation factors of Cu(II) over other elements at pH 4.7 and different O:A ratios (1:1, 2:1, 3:1, 5:1, 10:1) were also studied. Results revealed that the highest Cu(II) (98%), Ni(II) (67.21%), Co(II) (62.38%), Mn(II) (96%) and Au(III) (99%) were achieved at pH 4.7, O:A of 1:1, inert salt concentration of 200 mM and temperature of 25°C. The extraction selectivity of Cu over other elements in descending order was Ni>Co>Mn>Au throughout the different extraction conditions studied. Therefore, PKFAD is a potential green organic solvent for the extraction of different elements from aqueous solutions.

### **Keywords:**

Extraction, Palm kernel fatty acid distillate, Green organic solvent, Cu,Ni,Co,Mn,Au

### **Objectives:**

- To determine the pH-extraction isotherms using single-element solutions at a constant O:A ratio of 1:1.
- To determine the separation factors of Cu over other elements at pH 4.7 at different O:A (1:1, 2:1, 3:1, 5:1, 10:1) in multi-element solutions.

### **Methodology:**

Figure 1 illustrates the process flow on the multielement extraction from aqueous solutions by palm kernel fatty acid distillate.

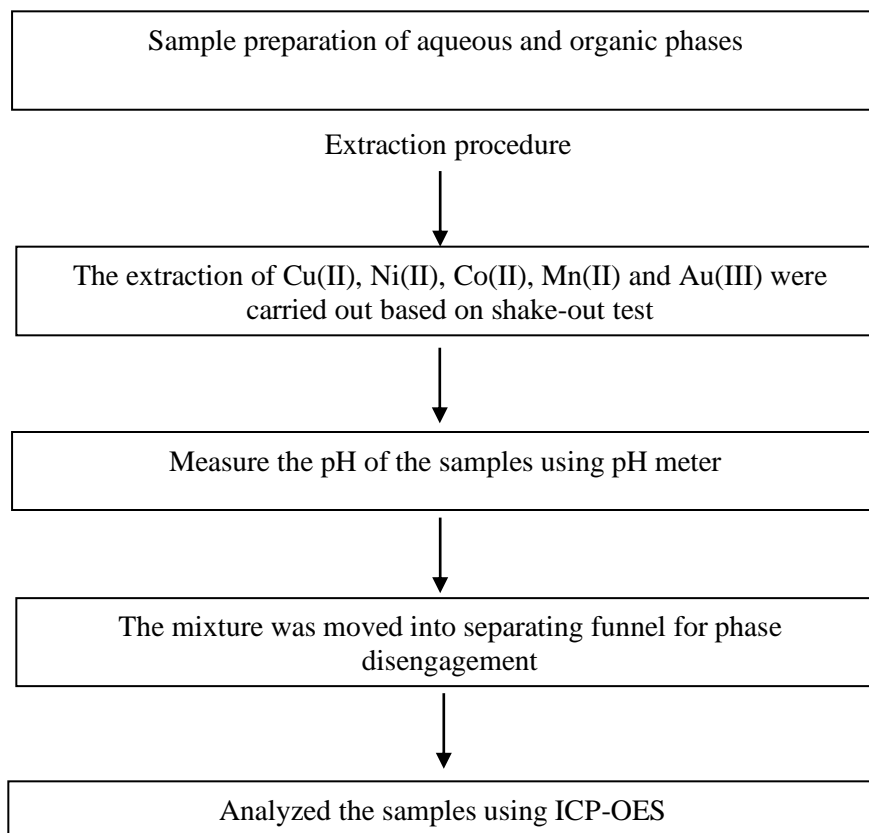


Figure 1 Process Flow of Project.

**Results:**

Table 1 The extraction efficiency of metal ions with PKFAD.

Metal ions	Extraction efficiency (%E)
Cu(II)	98
Ni(II)	67.21
Co(II)	62.38
Mn(II)	96.73
Au(III)	99

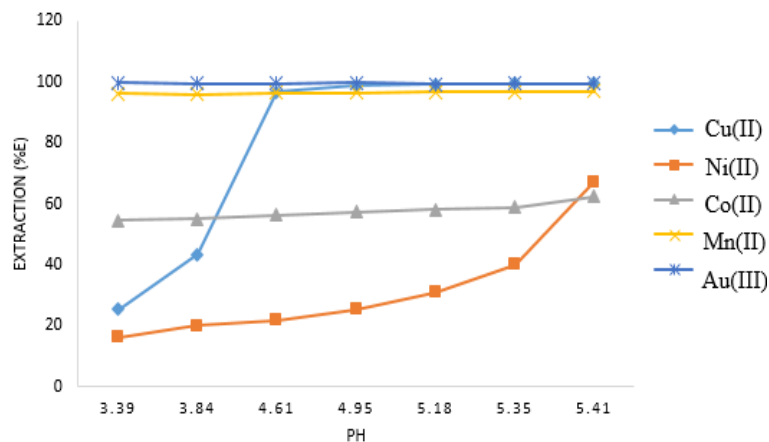


Figure 2 The pH-extraction isotherms of metal ions with PKFAD

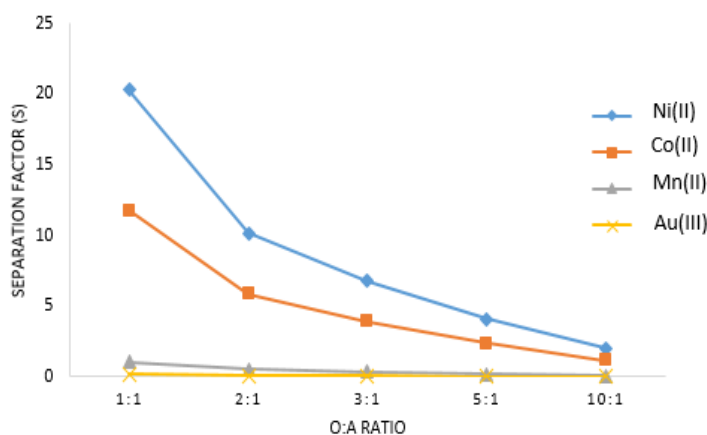


Figure 3 The separation factor (S) of Cu over other elements at pH 4.7 and different O:A ratios

Table 2 Separation factor of Cu over other elements at pH 4.7 at different O:A ratios.

Metal ions	Separation factor (S)				
	1:1	2:1	3:1	5:1	10:1
Ni(II)	20.3	10.15	6.77	4.06	2.03
Co(II)	11.75	5.88	3.92	2.35	1.18
Mn(II)	1.02	0.51	0.34	0.20	0.1
Au(III)	0.20	0.1	0.06	0.04	0.02

***Conclusion:***

In extraction study, %E of all metal ions were found not to vary with the initial concentrations of 100 mg/L. The extraction efficiency of Cu(II) was found to be 25.47% at pH of 3.39, and increase more than 95% at pH range of 4.61 to 5.41. However, the extraction efficiency of Ni(II) were the lowest compared to other metals. It was found that at pH 3.49, the extraction efficiency of Ni(II) was 16.27%, while the maximum extraction of Ni(II) was 67.21% at pH of 5.12. As for Co(II), the extraction efficiency was less than 60% at pH range of 3.42 to 4.51, while the maximum extraction was 62.38% at pH of 4.7. The extraction of Mn(II) from pH of 3.41 to 4.66 were found to be 96%, and slightly increase to 97% at maximum pH of 4.86. The extraction of Au(III) was achieved up to 99% at all pH range of 3.52 to 4.65.