Removal efficiencies of suspended solids and lead by modified tannin from guava leaves

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Introduction

Due to industrial activity and technological development, releases of Pb(II) and suspended solids to the environment are on the rise. Pb(II) pose a significant threat to the environment and public health because of ***toxicity***, incremental ***accumulation*** in the food chain and ***persistence*** in the ecosystem. Moreover, the treatment methods require high capital investment and creating sludge disposal problem.

➡ ***Production and characterization*** of modified tannin from guava leaves.

➡ Determination of ***turbidity and lead removal efficiencies*** in synthetic wastewater by modified tannin combined with alum.

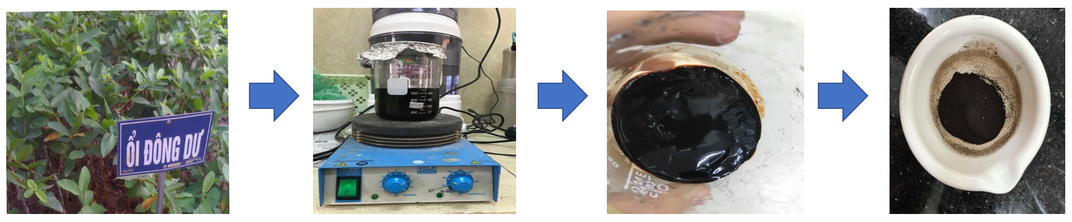
Methods and Materials

❖ Extraction of Tanin:

Guava leaves were dried and powdered → 100 g leaves powder + 600 ml tap water + 5 g NaOH → Mixture was stirred at 90°C for 1 hour → Liquid fraction was dried in oven 65°C → The resultant was tannin extract

❖ Modification of Tanin extract:

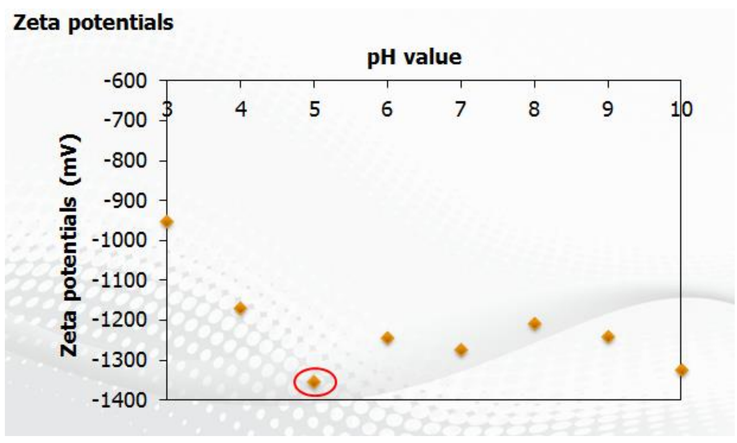
5 g tannin extract + 32 mL NaOH 0.125 mol/l + 30 mL distilled water → Mixture was stirred at 80°C + 10 ml HCHO 37% for 8 hours → The gummy product was dried in oven 65°C → Tannin gel was powdered and washed with HNO3 0.01 mol/l + distilled water → Modified tannin was dried in oven 65°C

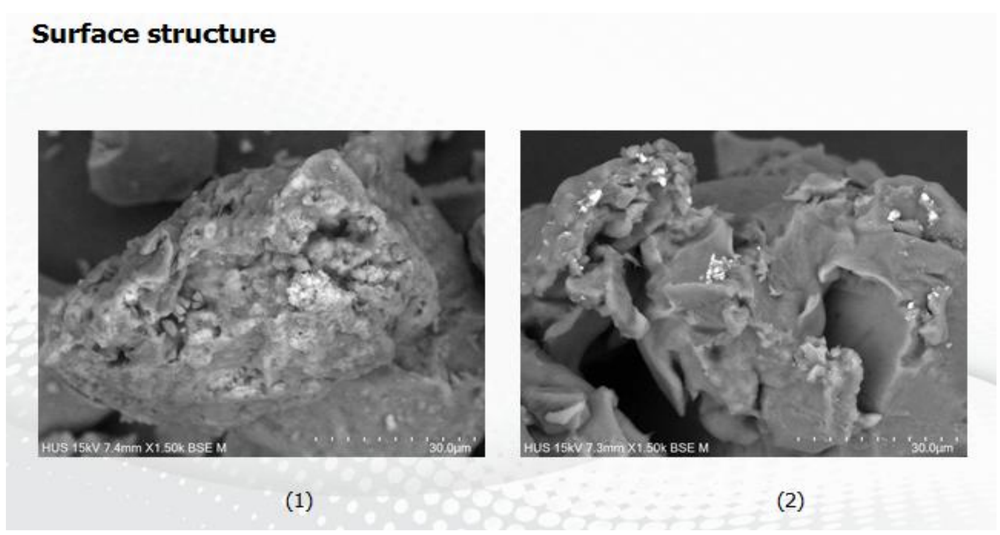


Guava leaves | Tannin extraction | Gummy product | Modified tannin

Results and Discussion

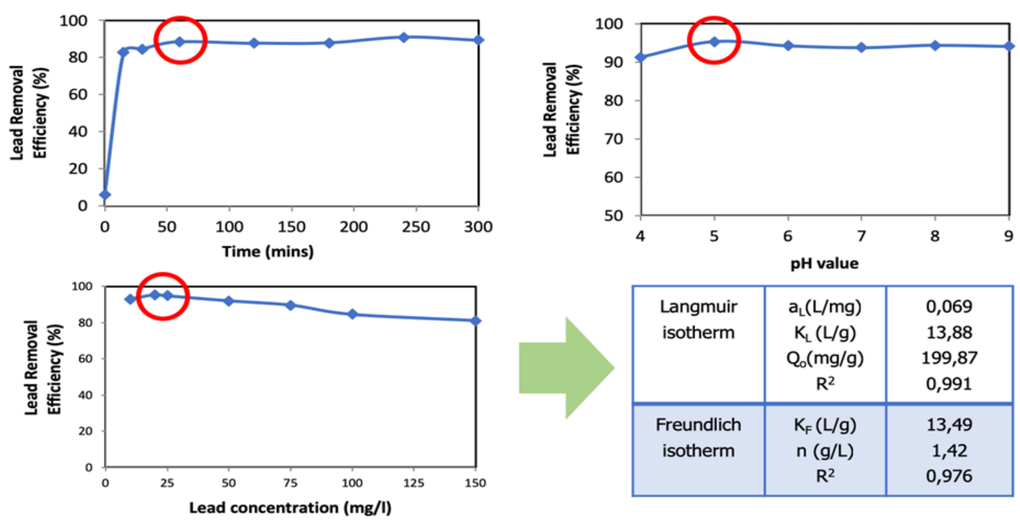
❖ Characterization of modified tannin





SEM images of modified tannin (1) before and (2) after lead adsorption.

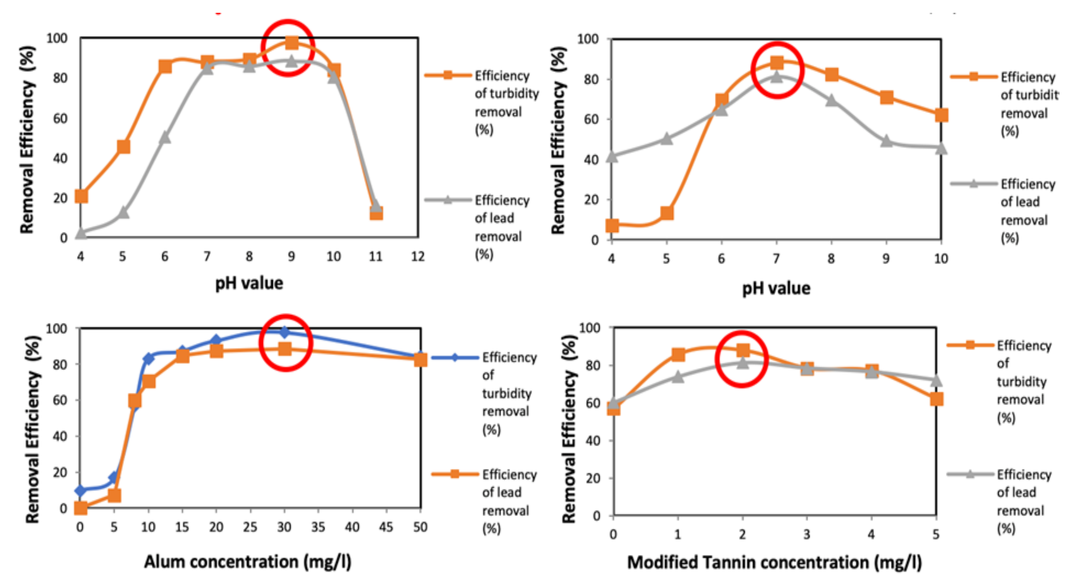
❖ Lead removal efficiencies in synthetic wastewater 1 containing only **Pb(II)**



Langmuir isotherm	a_L(L/mg)	0,069
	K_L (L/g)	13,88
	Q_o(mg/g)	199,87
	R^2	0,991
Freundlich isotherm	K_F (L/g)	13,49
	n (g/L)	1,42
	R^2	0,976

Results and Discussion

❖ Turbidity and lead removal efficiencies in synthetic wastewater 2 containing **kaolin + Pb(II)**



Conclusions

- Modified tannin could be applied as a ***flocculant*** and ***metal adsorbent***.
- The highest Pb (II) removal efficiencies ***95.32 %*** was obtained at ***60 minute contacting time*** and ***pH 5***. Experimental data were fitted to Langmuir isotherm (R^2 = ***0.991***), the monolayer adsorption capacity of modified tannin was ***199.87 mg/g***.
- ***2 mg/l*** modified tannin with ***8 mg/l*** alum resulted in the same efficiencies of ***81.20 %*** lead and ***88.02 %*** turbidity removal as when *15 mg/l* alum was used solely.
- Modified tannin from guava leaves is an appropriate material in simultaneous removal of suspended solids and lead in terms of its ***high sorption capacity, natural origin and abundance in Vietnam***.

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