Removal of Lead (II) Ions in synthetic wastewater using Ocimum tenuiflorum L. leaves adsorbent

Kasetsart University Laboratory School
Center For Education Research And Development

THE GLOBAL GOALS

6 CLEAN WATER AND SANITATION

TARGET 6.3

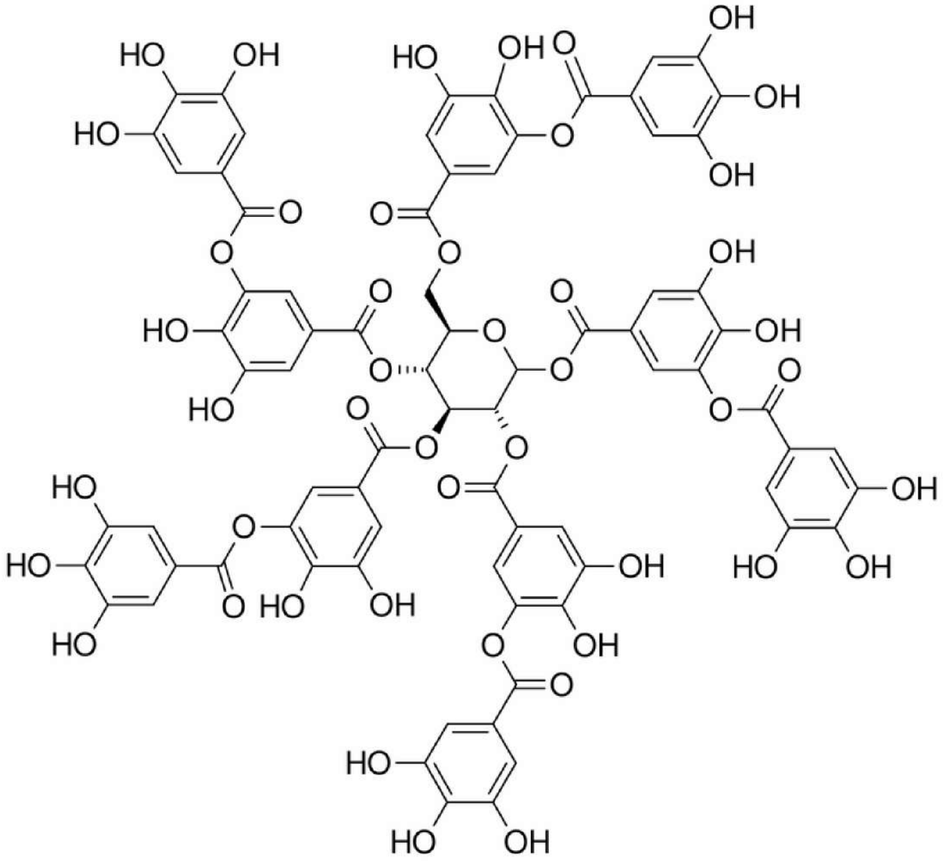
Water Pollution

How can high school students contribute and become involved in water pollution?

Holy basil purple type

Indigenous plant in Thailand

Tannin



Methodology

1. The Preparation of Ocimum tenuiflorum L. leaves adsorbent
2. The Adsorption Experiment

1 The Preparation of Ocimum tenuiflorum L. leaves adsorbent

Cut off & wash
the fresh leaves

Put into a mesh drying rack

Dry leaves in the sunlight
till they become crisp

Before

After

Crush into fine powder & Pass through a sieve
by using a mortar & pestle

Ocimum tenuiflorum L. leaves adsorbent

2 The Adsorption Experiment

- Varying the adsorbent dosage from 2 to 10 grams
- Prepare Lead (II) nitrate 0.2 Molar 75 mL
- Filtered out the adsorbent from the solution
- Add Potassium iodide 0.4 Molar 75 mL
- The precipitate was separated by filtration
- The precipitate was weighed gravimetrically

Precipitation reaction

Molecular equation

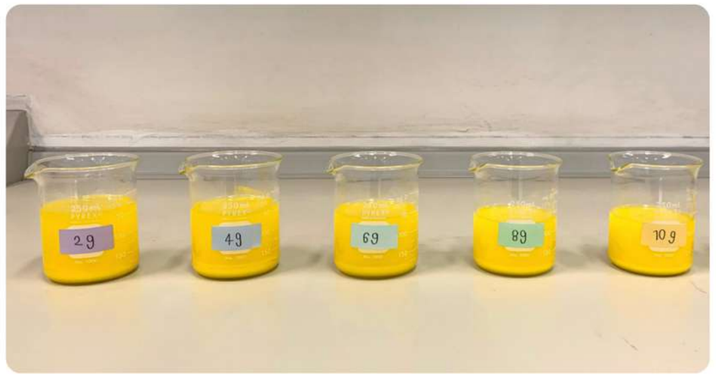
$$Pb(NO_3)_2(aq) + 2KI(aq) \rightarrow PbI_2(s) + 2KNO_3(aq)$$

Ionic equation

$$Pb^{2+}(aq) + \cancel{2NO_3^-(aq)} + \cancel{2K^+(aq)} + 2I^-(aq) \rightarrow PbI_2(s) + \cancel{2K^+(aq)} + \cancel{2NO_3^-(aq)}$$

Net ionic equation

$$Pb^{2+}(aq) + 2I^-(aq) \rightarrow PbI_2(s)$$



Results

Adsorbent dosage (g)	The mass of PbI_2(g)	The mass of Pb in PbI_2(g)	The percent Pb^{2+} removal (%)	The adsorption capacity (g /g adsorbent)
2.00	6.26	2.81	9.59	0.147
4.00	5.08	2.28	26.64	0.207
6.00	3.36	1.51	51.42	0.266
8.00	1.50	0.69	77.80	0.302
10.00	1.10	0.49	84.23	0.262

The mass of $Pb(NO_3)_2$in Solution 0.2M 75mL

$$0.2\ \text{mol/L} = \frac{1\ \text{mol } Pb(NO_3)_2}{331.20\ \text{g } Pb(NO_3)_2} \times \frac{X\ \text{g } Pb(NO_3)_2}{75\ \text{mL soln}} \times \frac{1000\ \text{mL soln}}{1\ \text{L soln}}$$

$$x = 4.968\ \text{g } Pb(NO_3)_2$$

The mass of Pb in $Pb(NO_3)_2$ 0.2M 75mL

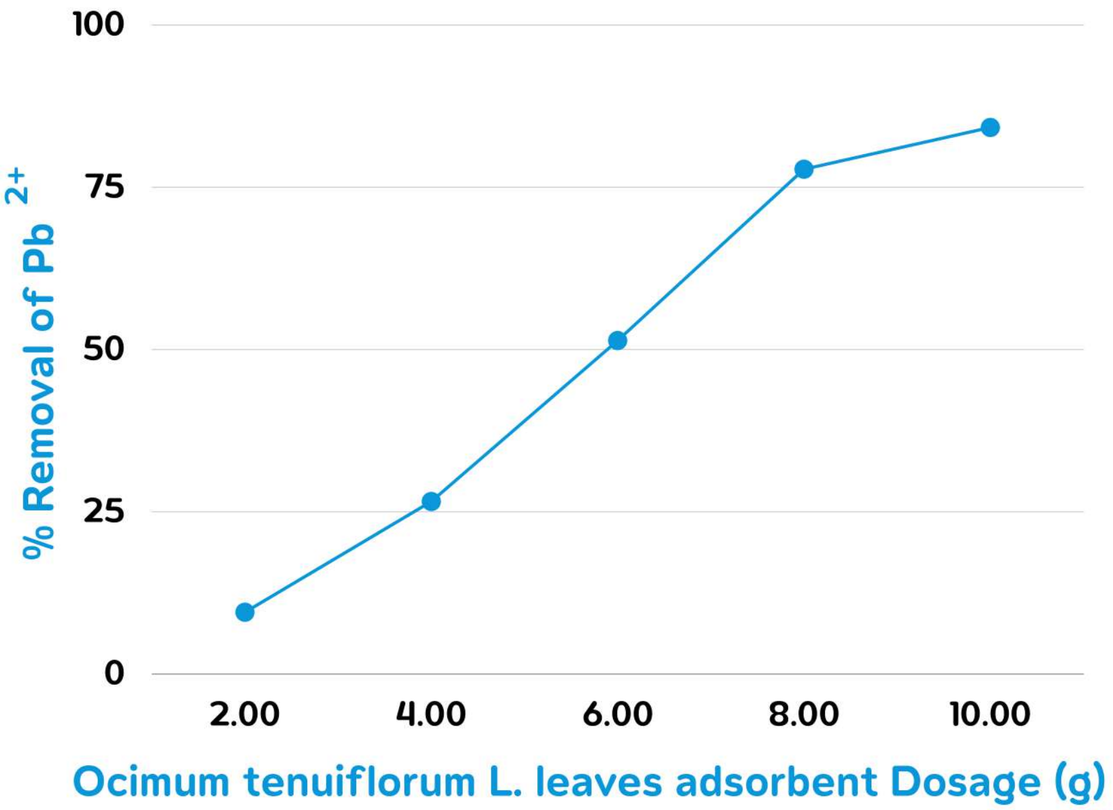
$$Pb = \frac{207.200\ \text{g Pb}}{331.200\ \text{g } Pb(NO_3)_2} \times 4.968\ \text{g } Pb(NO_3)_2$$

$$Pb = 3.108\ \text{g}$$

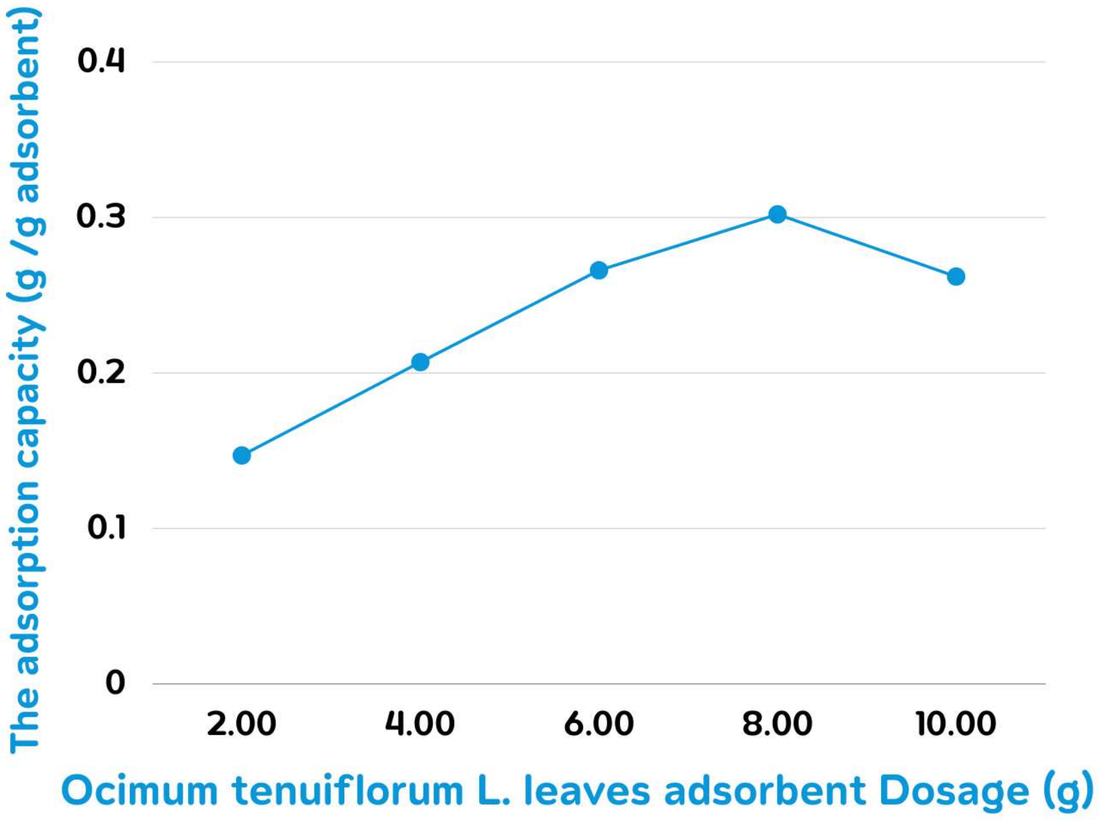
$$\text{The percent } Pb^{2+} \text{ removal (\%)} = \frac{\text{The mass of Pb in } Pb(NO_3)_2\text{(g)} - \text{The mass of Pb in } PbI_2\text{(g)}}{\text{The mass of Pb in } Pb(NO_3)_2\text{(g)}} \times 100\%$$

$$\text{The adsorption capacity (g /g adsorbent)} = \frac{\text{The mass of Pb in } Pb(NO_3)_2\text{(g)} - \text{The mass of Pb in } PbI_2\text{(g)}}{\text{Dosage of adsorbent (g)}}$$

Variation of the percent removal of Pb2+ with Ocimum tenuiflorum L. leaves adsorbent dosage



Variation of the adsorbent capacity with Ocimum tenuiflorum L. leaves adsorbent dosage



The percent removal of lead (II) ions and the adsorption capacity increased with the increase in adsorbent dosage seeing that the available surface area also increase.

The use of Ocimum tenuiflorum L. leaves adsorbent for the removal of lead (II) ions in synthetic wastewater

- Technically feasible
- Efficient
- Environmentally friendly