

Modified Clinoptilolite for the Removal of Rhodamine B Dye from Wastewater

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Surface Area Determination of the Adsorbent

For determination of surface area, 0.1g of modified CLN was added in 10 mL of the standard iodine solution. Then the solution was kept on a hot plate stirrer for one hour at room temperature. Then the solution was diluted up to 50 mL with distilled water and kept for one hour until the solution reached its equivalence point. The solution was filtered by using filter paper. 10 mL filtrate was taken in titration flask, standardized sodium thiosulfate solution was filled up to the mark in the burette and continued the addition of sodium thiosulfate solution drop wise into the titration flask until the solution turned pale yellow, then 3-4 mL starch solution was added to the pale yellow solution which got dark blue. This dark blue color was because of free iodine which was present in the solution combined with starch to form a complex. Then the solution was again titrated with sodium thiosulfate until the color was disappeared. Results are given in Table S1 and S2.

Table S1 Concentration of iodine solution before filtration.

Mean normality of $\text{Na}_2\text{S}_2\text{O}_3 \cdot 5\text{H}_2\text{O} = 0.19$

I ₂ solution volume	Sodium Thiosulfate solution Consumed volume	I ₂ solution Normality	I ₂ means normality
10	32.5	0.617	0.614
10	32	0.608	
10	32.5	0.617	

Table S2. Concentration of iodine solution after filtration for the determination of average normality of sodium thiosulfate.

I ₂ volume	The consumed volume of sodium Thiosulfate solution	I ₂ Normality	I ₂ Average normality
10	6.8	0.136	0.118
10	5.6	0.112	
10	5.3	0.106	

The surface area of the adsorbent was calculated using equation (S1) which is given below. Surface area results are given in Table S3.

$$\text{Surface Area} = 253.6 \{V_1 (C_i - C_f)\} \quad \text{Eq. (S1)}$$

1 mole of iodine surface area is = 253.6

V_1 for iodine solution volume

C_i is the Concentration of iodine solution before adsorption.

After adsorption C_f is the Concentration of iodine solution

$$\text{S.A} = 253.6 \{V_1 (C_i - C_f)\}$$

$$\text{S.A} = 253.8 [10 (0.614 - 0.59)]$$

$$S.A = 253.8 [10 (0.024)]$$

$$\text{Surface area} = 60.912 \text{m}^2/\text{g}$$

Table S3. Surface area of modified CLN.

Sample	Maximum particle size (μm)	Surface area (m^2g^{-1})
Modified CLN	> 600	60.192
Raw CLN	> 600	47.131