

# Modified natural zeolite as adsorbent for remazol black b dye: Kinetics and equilibrium aspects

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*AIP Conf. Proc.* 2556, 040011 (2023)

<https://doi.org/10.1063/5.0112154>

Effective and inexpensive adsorbents are needed for wastewater treatment. This study describes the use of Cu/natural zeolite as an adsorbent in the adsorption of remazol black b dye in terms of kinetics and isotherms. Cu/zeolite adsorbent was obtained by activating natural zeolite using HCl and  $\text{NH}_4\text{Cl}$  solution then impregnated using  $\text{Cu}(\text{NO}_3)_2 \cdot 3\text{H}_2\text{O}$  solution. Characterization of adsorbents using XRD, and SEM-EDX tools. Adsorption with a batch system was carried out at various contact times of 5, 15, 20, 60, and 300 minutes as well as variations in the concentration of 5, 10, 15, 20, 25, and 30 ppm. UV-Vis spectrophotometer was used to measure the concentration of remazol black b dye solution. The adsorption data were tested on the kinetic equations of pseudo-first-order, pseudo-second-order, and intraparticle diffusion. The adsorption isotherms were analyzed using Langmuir, Freundlich, Temkin, Harkin-Jura, Jovanovic, Halsley, Elovich isotherms. The results showed that based on the SEM images, the zeolite after activation was in the form of smaller and more organized granules than the zeolite after activation. XRD analysis showed that the zeolite had a structure of 42.8% mordenite, 39.8% clinoptilolite, and 17% quartz. EDX analysis showed the mass percentage of Cu on the adsorbent was 1.58%. Equilibrium contact time was reached in the 300th minute with an adsorption capacity of 0.4299 mg/g. The largest adsorption capacity was obtained at the initial concentration of remazol black b dye of 25 ppm with an adsorption capacity value of 0.0691 mg/gram. The adsorption of remazol black b dye using Cu/natural zeolite as adsorbent followed

pseudo-second-order adsorption kinetics and Langmuir adsorption isotherm pattern.

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Topics

[Waste-water treatment](#), [Zeolites](#), [UV-visible spectrophotometer](#), [Energy dispersive X-ray spectroscopy](#), [Dye](#), [Adsorption isotherm](#), [X-ray diffraction](#)

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