

## Effective adsorption of 2-nitroaniline from wastewater applying mesoporous material MCM-48: equilibrium, isotherm, and mechanism investigation

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### ABSTRACT

In this work, the MCM-48 mesoporous material was prepared and characterized to apply it as an active adsorbent for the adsorption of 2-nitroaniline (2-nitrobenzenamine) from wastewater. The MCM-48 characterizations were specified by implementing various techniques such as scanning electron microscopy, energy-dispersive X-ray analysis, X-ray diffraction, Brunauer–Emmett–Teller surface area, pore-size distribution, and Fourier-transform infrared spectroscopy. The batch adsorption results showed that the MCM-48 was very active for the 2-nitroaniline adsorption from wastewater. The adsorption equilibrium results were analyzed by applying isotherms like Langmuir and Freundlich. The Langmuir isotherm was used to calculate the theoretical and experimental maximal adsorption capacity of 100 and 65 mg/g, respectively. The Langmuir model is superior to the Freundlich model for the adsorption of 2-nitroaniline onto the mesoporous material MCM-48. The results demonstrated that the kinetics models of the adsorption are very fast and close to the pseudo-second-order model. The findings of adsorption isotherms and kinetics studies indicate the adsorption mechanism is a chemisorption and physical adsorption process.

**Keywords:** Mesoporous material; 2-Nitrobenzenamine; Adsorption isotherm; Adsorption kinetics; Wastewater treatment; Adsorption mechanism; Characterization MCM-48; Preparation MCM-48; Dye removal; Adsorbent regeneration

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