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Adsorption Performance of Two Metal-Organic-Frameworks for Sunset Yellow Dye via Box–Behnken Design

Talita Valverde F. da Silva[1] , Flávia H. Silva[1] , Marcone Augusto L. de Oliveira[1], Charlane C. Corrêa[1]*

[1] *Chemistry Department, Federal University of Juiz de Fora, Juiz de Fora-MG, Brazil.*
**Correspondence e-mail: charlane.cimini@ufjf.br*

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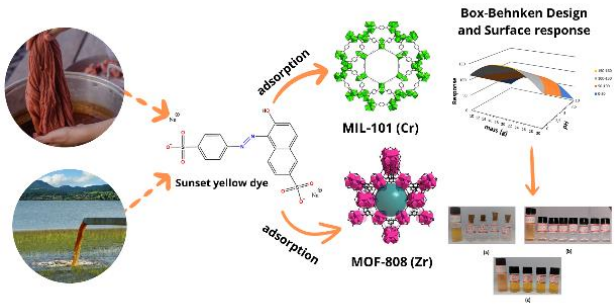
Metal-organic frameworks (MOFs) have emerged as a promising class of porous materials with a wide range of potential applications. In this study, we have synthesized and characterized two MOFs: MIL-101 (Cr) and MOF-808 (Zr). The MOFs were utilized as adsorbent materials for the dye Sunset Yellow in aqueous solution. A statistical study using Box-Behnken Design in conjunction with response surface methodology was used to optimize the variables directly affecting the process such as pH, temperature, and adsorbent mass. The study was conducted using 20 mL of an 18 ppm dye solution and a contact time of 24 hours. The results showed that both MOFs exhibited approximately 99 % adsorption, indicating a strong potential for use as adsorbents for SY. The adsorption process was fitted to a pseudo-second-order kinetic model, which indicated that the rate-limiting step in adsorption for both cases is chemisorption. Finally, an adsorption test of the synthesized MOFs showed on a wastewater sample from a Brazilian textile industry. Both MOFs showed effective performance in adsorbing the dyes present in the aqueous matrix, indicating that MOFs can be considered as promising materials for dye adsorption.

Figure 1: Schematic representation of the optimization, via BBD, of SY adsorption using MOFs.



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