

# Facile Ultrasonic Synthesis of Zirconium Based Porphyrinic MOFs for Enhanced Adsorption Performance Towards Anionic and Mixed Dye Solutions

Roya Hariri<sup>1</sup> · [Saeed Dehghanpour](#)<sup>1</sup> · Samaneh Sohrabi<sup>1</sup>

<sup>1</sup> Department of Chemistry, Faculty of Physics and Chemistry, Alzahra University, Tehran, Iran

## Abstract

A porphyrinic mesoporous metal–organic framework (PCN-222(M) (M = Mn, Fe, Cu)) has been synthesized by a simple sonochemical preparation method without high temperature in a short period of time. The ultrasonic method for the preparation of PCN-222(M) was found to be an efficient procedure with a good quantitative yield (PCN-222(M)-U). Harmful cationic and anionic dyes have been removed from wastewater using PCN-222(M). The comparative study of the influences of metalloporphyrin and non-metal porphyrin frameworks (PCN-222) on the adsorption process has been performed. Remarkably high adsorption capacity over PCN-222(M) for the anionic dyes is reported. The porphyrinic metal center of frameworks and pH values affected dye adsorption capacity, indicating the effective role of electrostatic interactions on dye adsorption. Due to the aggregation of MB and MO, a significant increase in the adsorption capacity was observed in a mixture of MB-MO solution at pH 7. High adsorption capacity over PCN-222(M) has been estimated using Langmuir and Freundlich equations. The adsorption kinetics, thermodynamic parameters, stability and reusability of adsorbents have also been reported. The stability of PCN-222(M) in water over three months was investigated (PCN-222(M)-3).

**Keywords:** MOF · PCN-222(M) (M = Mn, Fe, Cu) · Metalloporphyrin · Ultrasound synthesis · Dye adsorption · Adsorption isotherms.

**Link:** <https://link.springer.com/article/10.1007/s10904-020-01704-5>