Supporting Information

A Robust and Efficient Iron-Based Metal-Organic Framework for Enhanced Adsorption of Chlortetracycline from Aqueous Solutions: Kinetic, Thermodynamic, and Mechanistic Studies

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Cost Analysis

Representative catalogue prices from local Bangladeshi chemical suppliers suggest that ferric nitrate nonahydrate (Fe $(NO_3)_3 \cdot 9H_2O$, 98%) is available at approximately 1,400 BDT per 500 g, while trimesic acid (H_3BTC, 98%) the organic linker typically ranges from 2,000 BDT for 5 g to 33,000 BDT for 500 g, depending on pack size. Analytical-grade N, N-dimethylformamide (DMF) is also routinely used in Bangladeshi laboratories and is commonly sold in the low-thousand BDT range per litre, or about 15,000-16,000 BDT per gallon for imported material based on current catalogue pricing. Considering these reagent costs together with the low adsorbent dose applied in this study (0.25 g L^{-1}) and the strong reusability of Fe-MOF (≈83% removal retained after 10 cycles), the overall material/operating expense at laboratory scale is expected to remain manageable, and may become more cost attractive upon bulk synthesis. A full plant-scale techno-economic assessment is beyond the scope of the present work; however, these indicative values support the feasibility of Fe-MOF not only in terms of adsorption performance but also from a cost perspective in the Bangladeshi context[1].

Table S1: Removal efficiency (%) of chlortetracycline (CTC) as a function of initial concentration at different temperatures (30, 40, and 50 °C) under optimized adsorption conditions.

Antibiotic Concentration (ppb)	% Removal at 30°C	% Removal at 40°C	% Removal at 50°C
50	95.97	96.67	98.83
100	95.28	94.96	95.26
200	93.74	93.77	94.52
400	82.59	91.47	93.67
600	83.45	89.77	88.71
800	80.4	84.68	89.23
1000	77.83	80.37	86.17
1500	75.46	77.45	80.39
2000	74.03	77.23	80.04

References

1 N. Rai, S. Soni, A. Verma, A. Mittal, R. Baker, S. A. A. Shah and C. Arora, *Desalination and Water Treatment*, 2023, **307**, 180–189.