

Iron oxide-Chitosan Macroporous Nanocomposite Hydrogels for Efficient Heterogeneous Electro-Fenton Degradation of Ciprofloxacin

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Supplemental Material

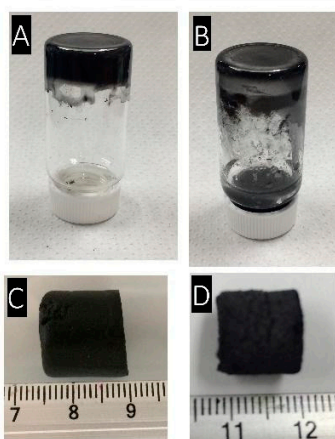


Figure S1. Photographs represent A) stable HIPEs, B) phase separation of HIPEs and monoliths C) before and D) after washing and lyophilizing.

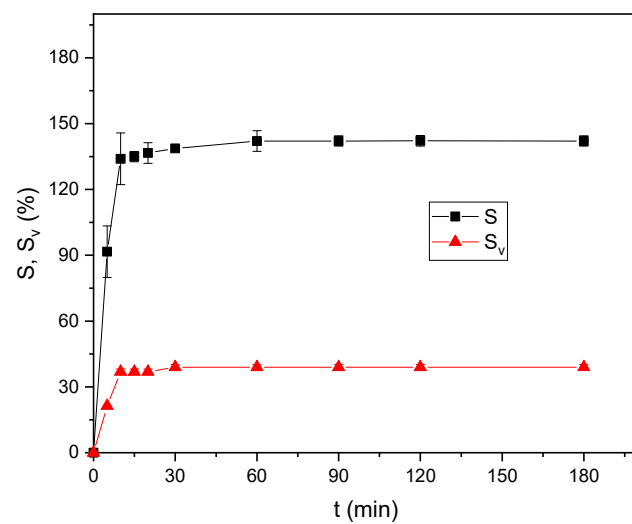


Figure S2. Gravimetric (%S) and volumetric (% S_v) swelling behavior of the PHIPE-6-2 monolith as a function of time.

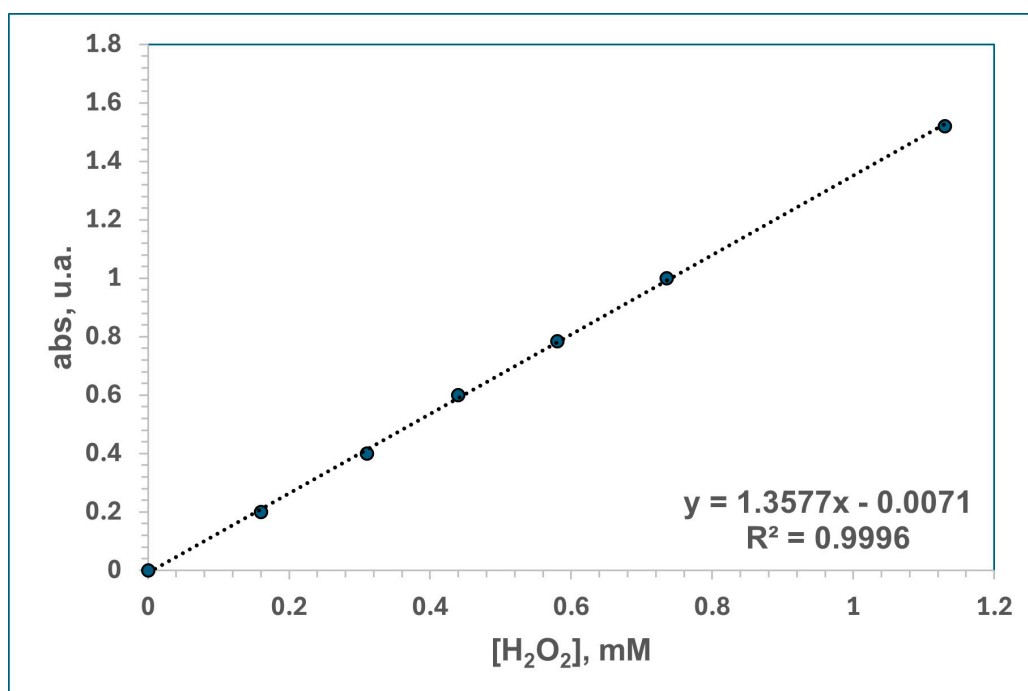


Figure S3. Calibration curve for electrogenerated hydrogen peroxide (H_2O_2) obtained by UV–Vis spectroscopy using the titanium(IV) oxysulfate method ($\text{TiO}_2 \cdot \text{H}_2\text{O}_2$ complex), measured at 404 nm.

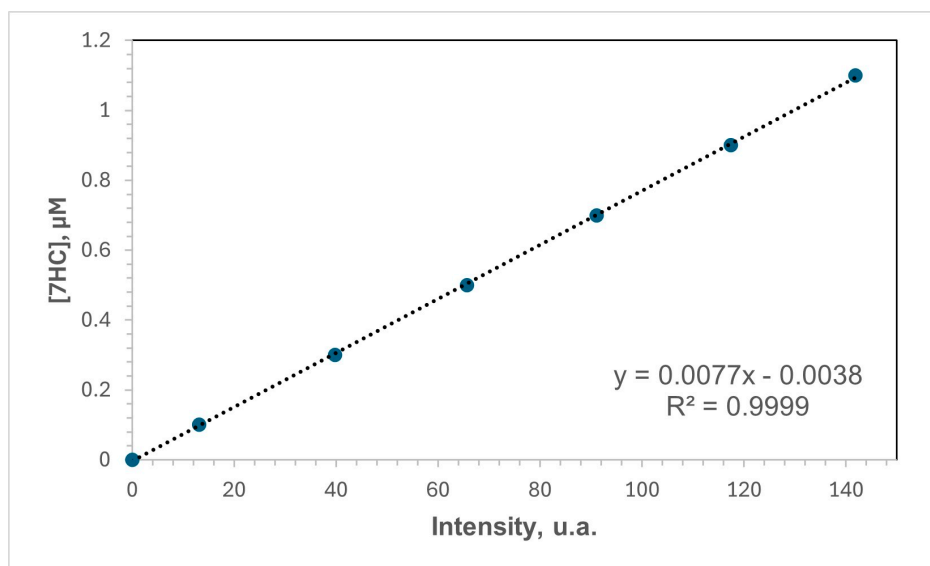


Figure S4. Calibration curve for hydroxyl radical ($\bullet\text{OH}$) determination using coumarin as a fluorescent probe. $\bullet\text{OH}$ radicals react with coumarin to form 7-hydroxycoumarin, whose fluorescence intensity ($\lambda_{\text{ex}} = 340 \text{ nm}$, $\lambda_{\text{em}} = 456 \text{ nm}$) is directly proportional to $\bullet\text{OH}$ concentration. The resulting linear correlation was used to quantify $\bullet\text{OH}$ generated during anodic oxidation and heterogeneous electro-Fenton processes.

Table S1. Summary of reported studies on ciprofloxacin (CIP) degradation by Fenton and electro-Fenton processes, including both homogeneous and heterogeneous systems.

System	COT degradation /time	[CIP] ₀ / pH	Reference
Homogeneous Fenton	37.9 % 45 min	[CIP] ₀ = 15 ppm pH 3.5	[1]
Homogeneous Fenton	55 % 60 min	[CIP] ₀ = 100 ppm pH 3	[2]
Homogeneous electro- Fenton	95 % 6 h	[CIP] ₀ = 0.15 mM pH 3	[3]
Heterogeneous Fenton FeS ₂ /SiO ₂	100% 60 min	[CIP] ₀ = 0.10 mM pH 3	[4]
Heterogeneous Fenton Pyrite	100 % 10 min	[CIP] ₀ = 20 ppm pH 4	[5]
Heterogeneous Fenton Biochars	90% 4 h	[CIP] ₀ = 10 ppm pH 4	[6]
Photo-Fenton Iron chelation	93.1% 45 min	[CIP] ₀ = 50ppm pH 3.5	[7]
Heterogeneous Electro- Fenton magnetite	97.3 % 180 min	[CIP] ₀ = 10 ppm pH 3	[8]
Heterogeneous Electro-Fenton Magnetite-CS PolyHIPE	95% 2min Complete mineralization 20 min	[CIP] ₀ = 100 ppm pH 3	This work

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