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Sustainable and Shaped Synthesis of MOF Composites Using PET Waste for Efficient Phosphate Removal

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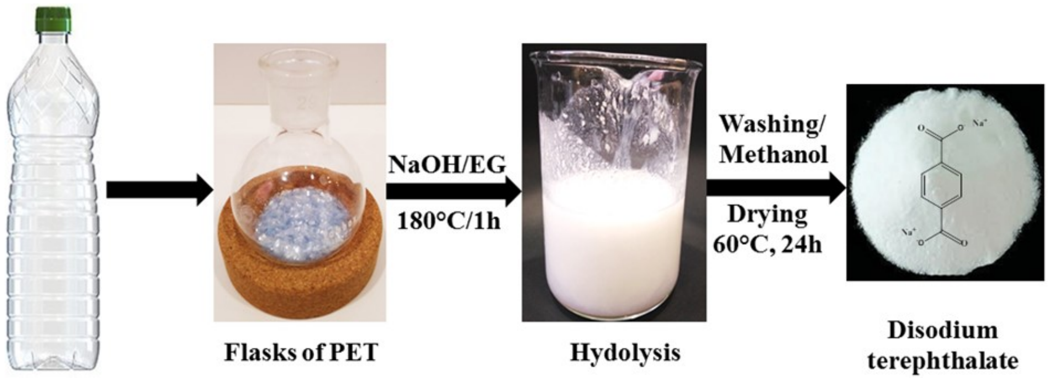


Figure S1. Schematic illustration of The PET conversion to DST.

Equation of PET conversion and DST yield

Eq S1: $$PET\ conversion = \{(WPET,0 - WPET,f) \div WPET,0\} \times 100$$

Eq S2: $$DST\ yield = \{WDST \div (WPET,0 - WPET,f)\} \times 100$$

where WPET,0 is the initial weight of PET (g); WPET,f is the residual weight of PET (g) ; and WDST = weight of DST obtained by hydrolysis (g).

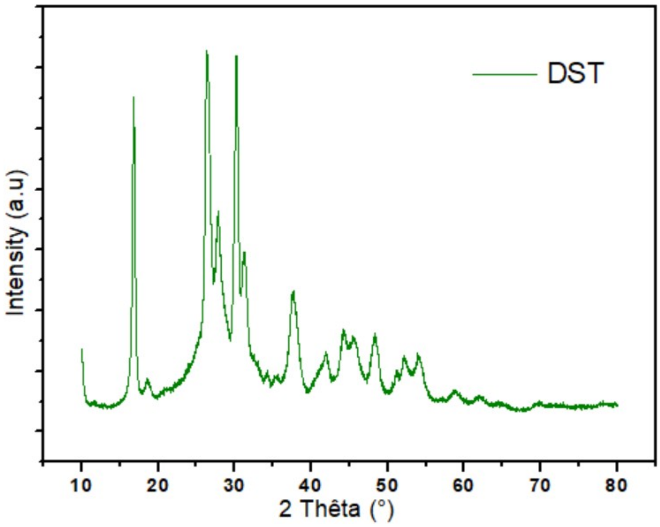
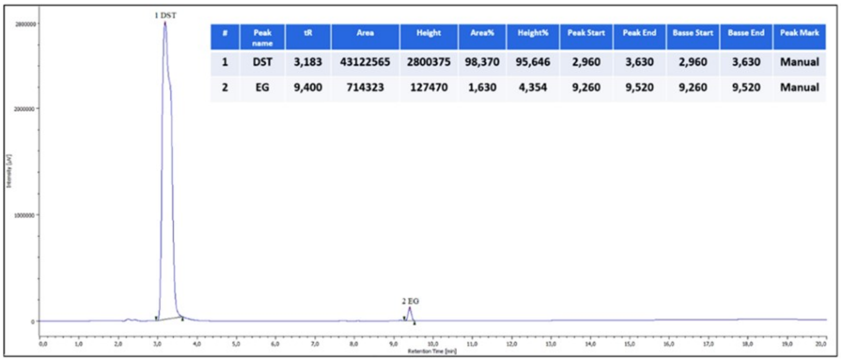


Figure S2. XRD Pattern of the synthesized DST.



#	Peak name	tR	Area	Height	Area%	Height%	Peak Start	Peak End	Basse Start	Basse End	Peak Mark
1	DST	3,183	43122565	2800375	98,370	95,646	2,960	3,630	2,960	3,630	Manual
2	EG	9,400	714323	127470	1,630	4,354	9,260	9,520	9,260	9,520	Manual

Figure S3. HPLC spectrum of the synthesized DST. Purity of DST was determined by UV-HPLC method with JASCO AS-4150, using the Luna C18 (150×60 mm, 3 µm) as the solid phase, water-acetonitrile (70:30) as the mobile phase. The detection wavelength was 254 nm and the flow rate was 1.5 mL/min.

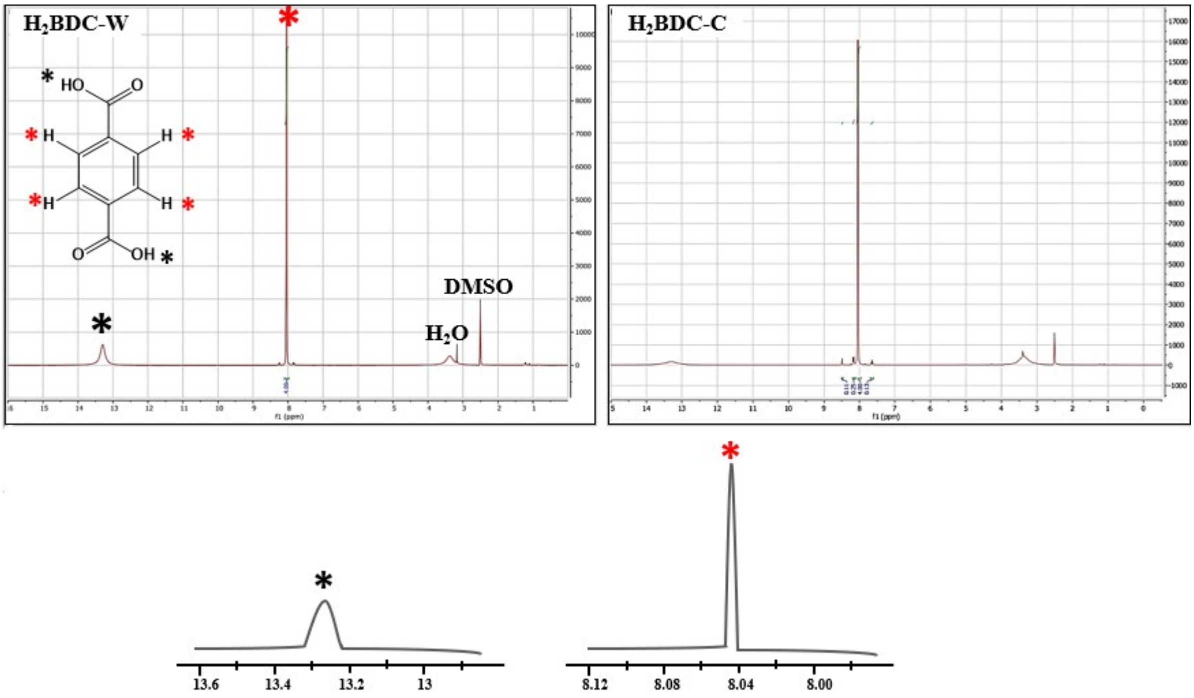


Figure S4. 1H NMR spectra of terephthalic acid prepared from waste (H_2BDC-W) and compared to the commercial one ((H_2BDC-C).

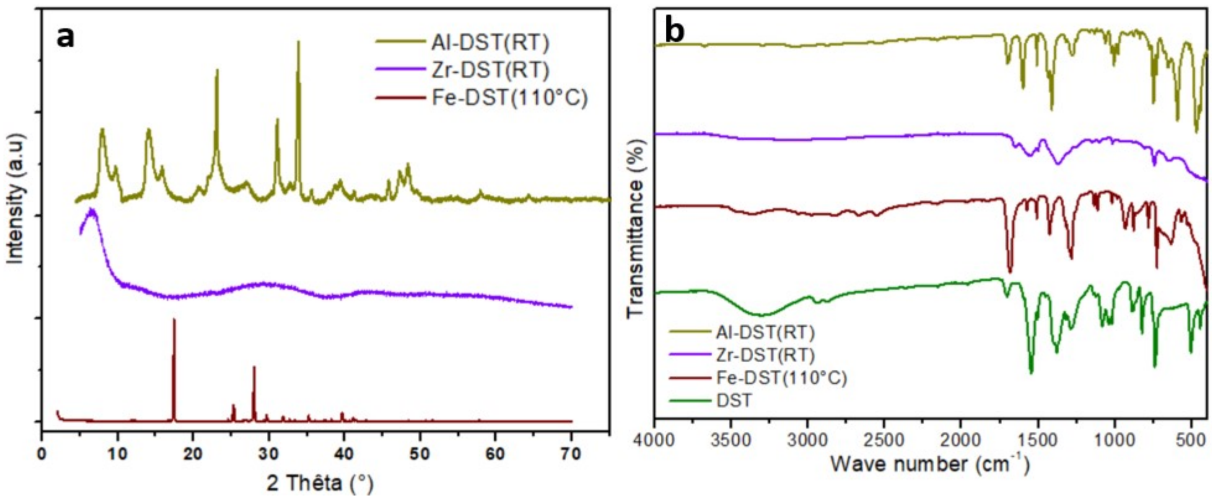


Figure S5. (a) the XRD pattern and (b) FTIR spectrum of Fe-DST (110 °C) Zr-DST (RT) and Al-DST (RT)

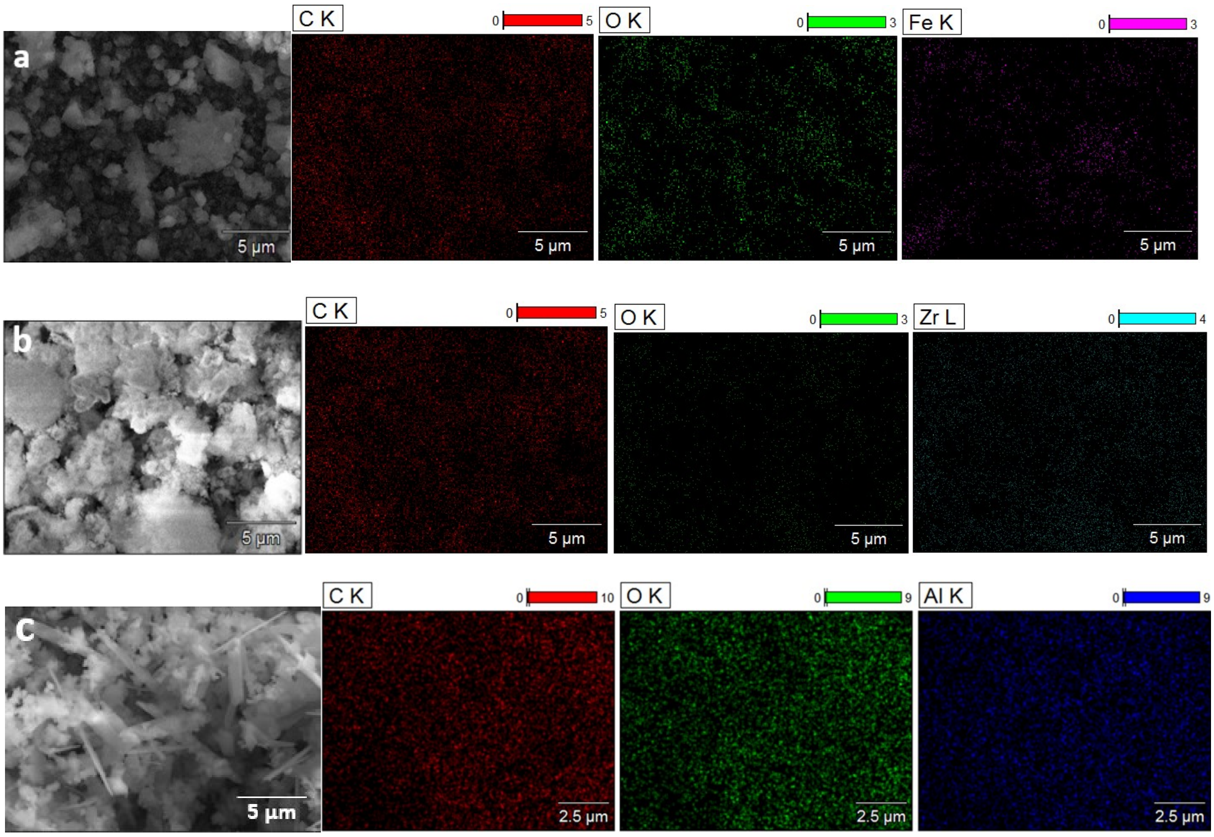


Figure S6. Figure 3: EDX mapping images of synthesized (a)) Fe-DST (RT); (b) Zr-DST (120°C) and (c) Al-DST (220°C).

Figure S7. picture of the lake where the real water was taken (IFRAN, MOROCCO)

Table S1: Kinetic parameters of the pseudo-first order and pseudo-second models for PET-based MOFs

Adsorbents	Pseudo-first-order kinetic			Pseudo-second-order kinetic		
	qe(mg/g)	K_1 (mg/g)	R^2	qe(mg/g)	K_2	R^2
Fe-DST(RT)	2.2174	0.4186	0.8111	2.3863	0.278	0.9733
Zr-DST(120°C)	2.2926	0.34869	0.8218	2.34586	0.497	0.9838

Table S2: Isotherm parameters of the Langmuir and Freundlich models for PET-based MOFs

Adsorbents	Langmuir model			Freundlich model		
	k_L(L/mg)	q_m (mg/g)	R^2	K_F (mg/g)	n	R^2
Fe-DST(RT)	0.3352	72.162	0.9502	21.3212	3.1546	0.8738
Zr-DST(120°C)	0.4611	66.6379	0.9829	19.6864	3.0479	0.9487