A compressible porous superhydrophobic material constructed by multi-template high internal phase emulsion method for oil-water separation.

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Preparation of oyster shell powders (OSPs)

Oyster shells were obtained from a local coastal beach of Techeng Island, Zhanjiang. The shells were soaked in an alcohol solution after cleaning with a brush. After that, they were washed with deionized water, air-dried, and pulverized in a grinder, which was followed by cribration with a 1000 mesh sieve to produce the OSP for subsequent experiments.

Preparation of oyster shell powders (OSPs@Foam)

A predetermined amount of 0.1 g DVB and 0.4 g St were sequentially added to a glass sample vial, followed by the addition of 0.1 g Span 80, 0.02 g AIBN, and 0.05 g OSPs. The resulting mixture was sonicated for 5 minutes to ensure uniform mixing. Distilled water was then added in batches to the glass sample vial, with the vial vigorously shaken by hand after adding 1 mL to emulsify the emulsion in the system thoroughly. The resulting high internal phase emulsion was subjected to thermal treatment at 70°C for 8 hours. The glass vial was carefully cracked open, and the material was extracted and dried in an oven at 60°C. The sample was then subjected to Soxhlet extraction using anhydrous ethanol as the extractant to remove unreacted material and impurities.

The simulation results of oil absorption kinetic models

Models	Parameters	Expressions	Oil or solvents					
			Ethanol	Methanol	Petroleum ether	CTC	Diesel	Corn oil
First kinetic	R^2	$\ln(Q_e - Q_t) = lnQ_e - k_1 t$	0.9015	0.9650	0.9729	0.8921	0.8859	0.8607
	lnQ_e		3.46	3.37	3.28	4.75	3.58	3.49
	k_1		-0.0107	-0.0196	-0.0249	-0.0229	-0.0051	-0.0007
Secondary kinetic	R^2	$\frac{t}{Q_t} = \frac{1}{k_2 Q_e^2} + \frac{t}{Q_e}$	0.9785	0.9942	0.9873	0.9942	0.9621	0.9477
	$1/k_2 Q_e^2$		0.9026	0.5668	0.4526	0.2136	2.5920	21.0746
	$1/Q_e$		0.0228	0.0278	0.0236	0.0092	0.0265	0.0314
Elovich kinetic	R^2	$Q_t = a + blnt$	0.9428	0.9773	0.9502	0.9664	0.9055	0.8262
	a		-2.67	0.24	0.18	2.22	-6.26	-6.63
	b		6.9073	5.9723	7.2452	17.0173	5.6650	3.4450
Weber-Morris kinetic	R^2	$Q_t = k_i t^{1/2} + C$	0.9906	0.9478	0.9656	0.9495	0.9976	0.9934
	C		6.26	7.25	6.87	24.48	2.81	3.03
	k_i		1.8679	1.8101	2.5918	4.6772	1.2213	0.3398