



Supplementary Materials

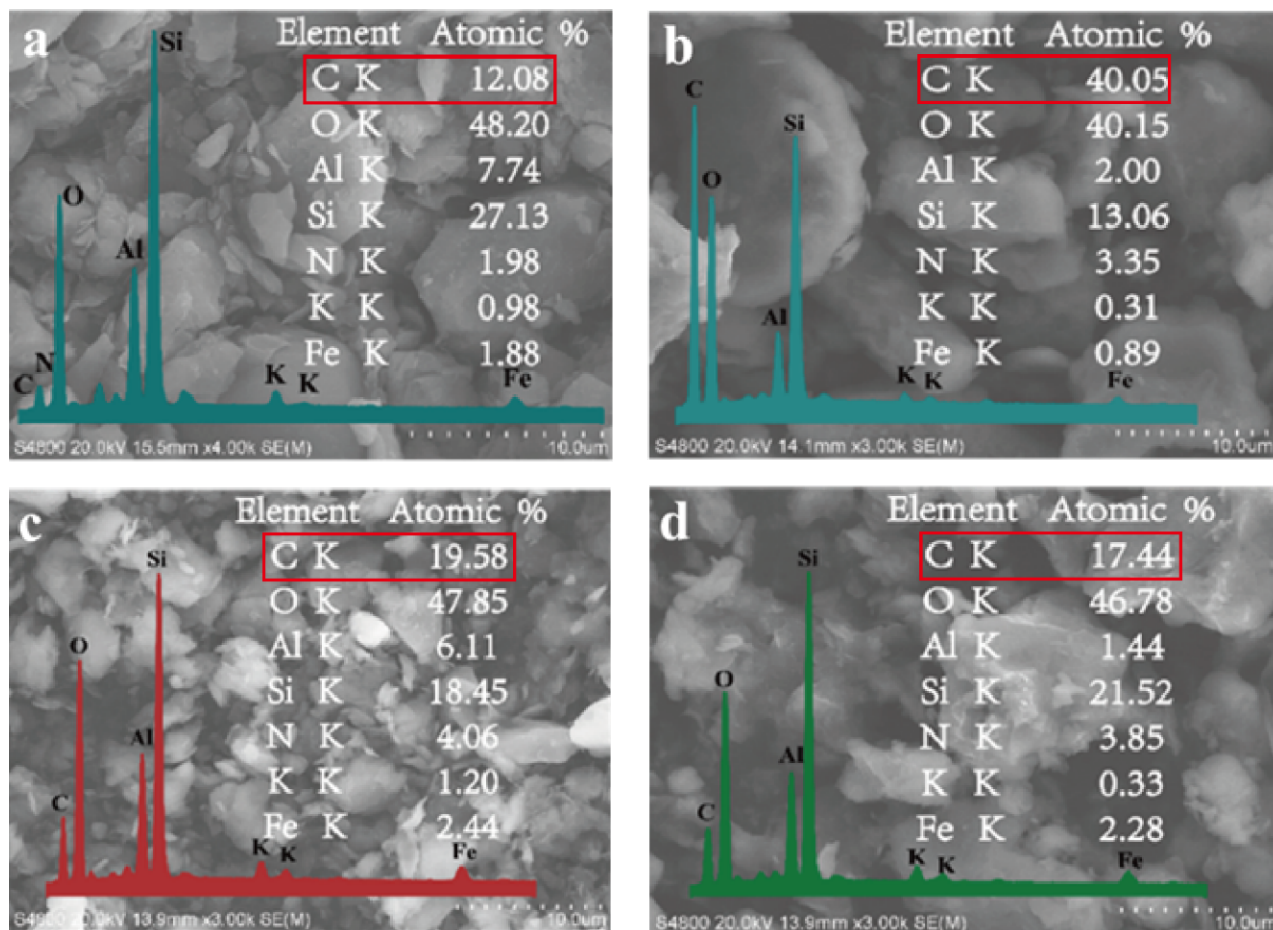


Fig. S1. SEM-EDS profiles of different soil samples surface. (a) uncontaminated soil, (b) diesel-contaminated soil, (c) diesel-contaminated soil washed with NCEO₉, (d) diesel-contaminated soil washed with NPEO₁₀. Experimental conditions: Surfactant concentration, 1 wt%; pH 8.5; elution time, 24 h; initial diesel concentration. 7.52 ± 0.20 wt%; 25°C.

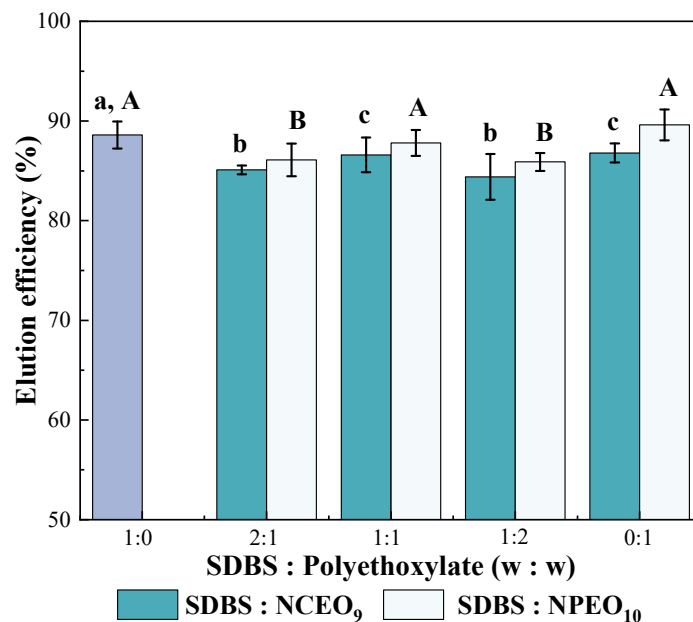


Fig. S2. EE of NCEO₉-SDBS binary system for diesel-contaminated soil. Total surfactant concentration of 1 wt%, pH 8.5, initial diesel concentration of 7.52 ± 0.20 wt%, 24 h. Data are expressed as an average \pm SD (n=3). Different letters indicate statistically significant differences based on the Duncan test at the significance level ($P < 0.05$).

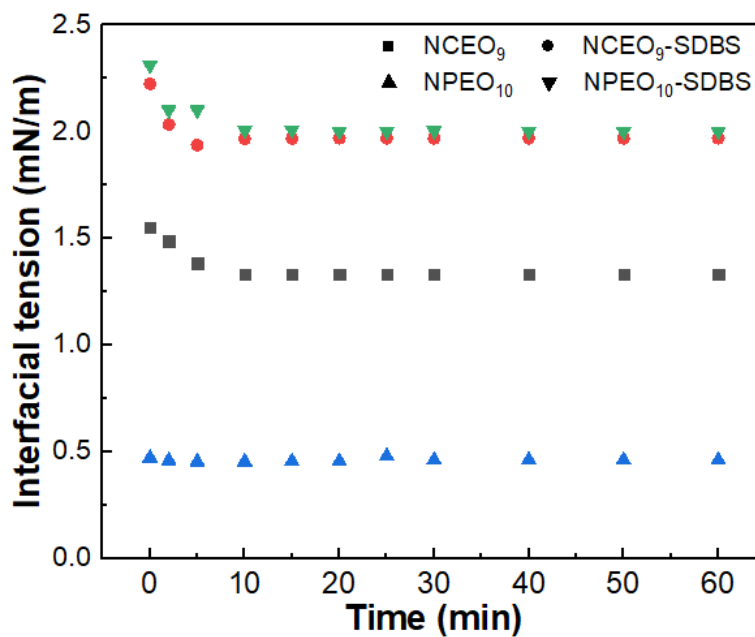


Fig. S3. Dynamic interfacial tension as a function of time for surfactant solutions at 25°C

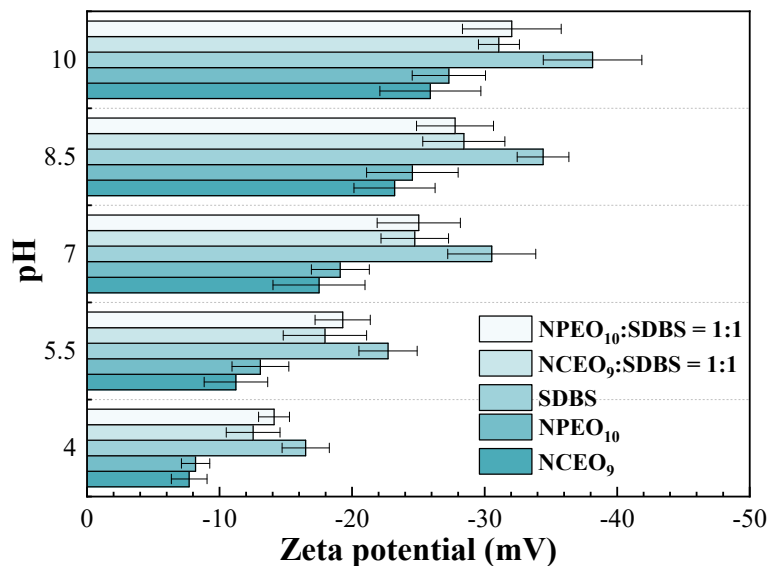


Fig. S4. Zeta potential of soil grains in micellar solution at different pH.

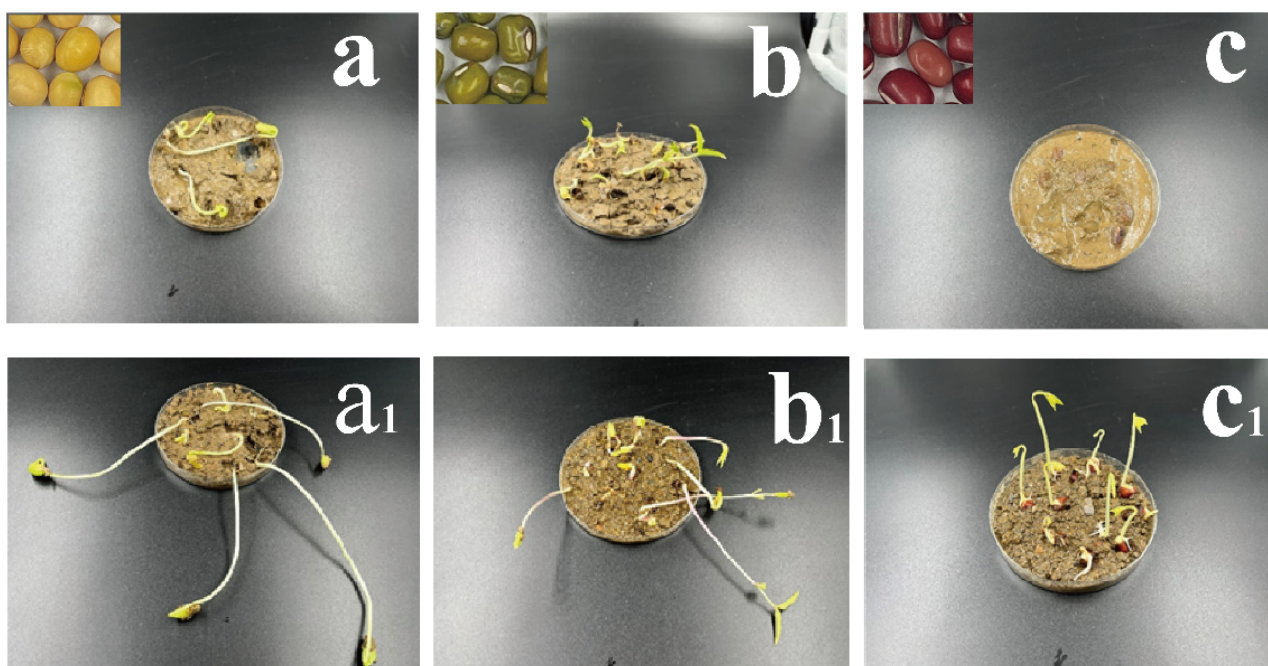


Fig. S5. Photographs of three seeds grown on diesel-contaminated soil before and after elution for 14 days. (a) growth of soybean on NCEO₉ washed diesel-contaminated soil, (b) growth of mung beans on NCEO₉ washed diesel-contaminated soil, (c) growth of red beans on NCEO₉ washed diesel-contaminated soil, (d) growth of soybean on diesel-contaminated soil, (e) growth of mung beans on diesel-contaminated soil, (f) growth of red beans on diesel-contaminated soil.

Table S1. Features of the soil samples

pH	Organic Carbon (%)	Free water (%)	Bound water (%)	Sand (%)	Silt (%)	Clay (%)	CEC (cmol kg ⁻¹)
8.35 ± 0.12	2.77 ± 0.31	8.11±0.22	1.48 ± 0.08	81.25%	12.56%	6.19%	6.95 ± 0.68

Table S2. Surface activity parameters of surfactants in ultrapure water

Surfactants	cmc (g/L)	γ_{cmc} (mN/m)	Π_{cmc}	pC ₂₀	cmc/c ₂₀	Γ_m (10 ⁻¹⁰ mol/cm ²)	A _m (Å ²)
NPEO ₁₀	0.037	31.26	40.76	5.48	16.86	3.14	52.91
NCEO ₉	0.054	29.37	42.65	5.40	21.86	2.98	55.71
SDBS	0.763	34.61	37.41	3.26	3.99	2.59	64.10
SDBS : NCEO ₉ (1:1)	0.062	31.00	41.02	5.13	18.74	2.72	61.16
SDBS : NPEO ₁₀ (1:1)	0.051	32.49	39.53	5.11	14.42	2.77	59.91

Table S3. Kinetic equations and fitted eigenvalues for desorption of diesel using different concentrations of NCEO₉

Concentrations of NCEO ₉ (wt%)	First-order kinetic equations	Elovich equations	Parabolic equations
0	lnS = 0.0121t + 3.2592 R ² = 0.5951	S = 2.556ln t + 25.5758 R ² = 0.9453	S = 2.1789t ^{1/2} + 23.7040 R ² = 0.8009
0.001	lnS = 0.0092t + 3.3764 R ² = 0.6681	S = 2.0938ln t + 28.9073 R ² = 0.9679	S = 1.8134t ^{1/2} + 27.2976 R ² = 0.8530
0.01	lnS = 0.0080t + 3.5964 R ² = 0.6103	S = 2.3203ln t + 35.9955 R ² = 0.9487	S = 1.9725t ^{1/2} + 34.2976 R ² = 0.8056
0.1	lnS = 0.0074t + 3.8398 R ² = 0.6914	S = 2.6111ln t + 46.0744 R ² = 0.9832	S = 2.2670t ^{1/2} + 44.0540 R ² = 0.8708
1	lnS = 0.0035t + 4.1109 R ² = 0.4914	S = 1.8478ln t + 60.0877 R ² = 0.9620	S = 1.5722t ^{1/2} + 58.7324 R ² = 0.8183