Electronic Supplementary Material (ESI) for Soft Matter.

Supporting information

Porous superabsorbent composites prepared from aqueous foam templates and application evaluation

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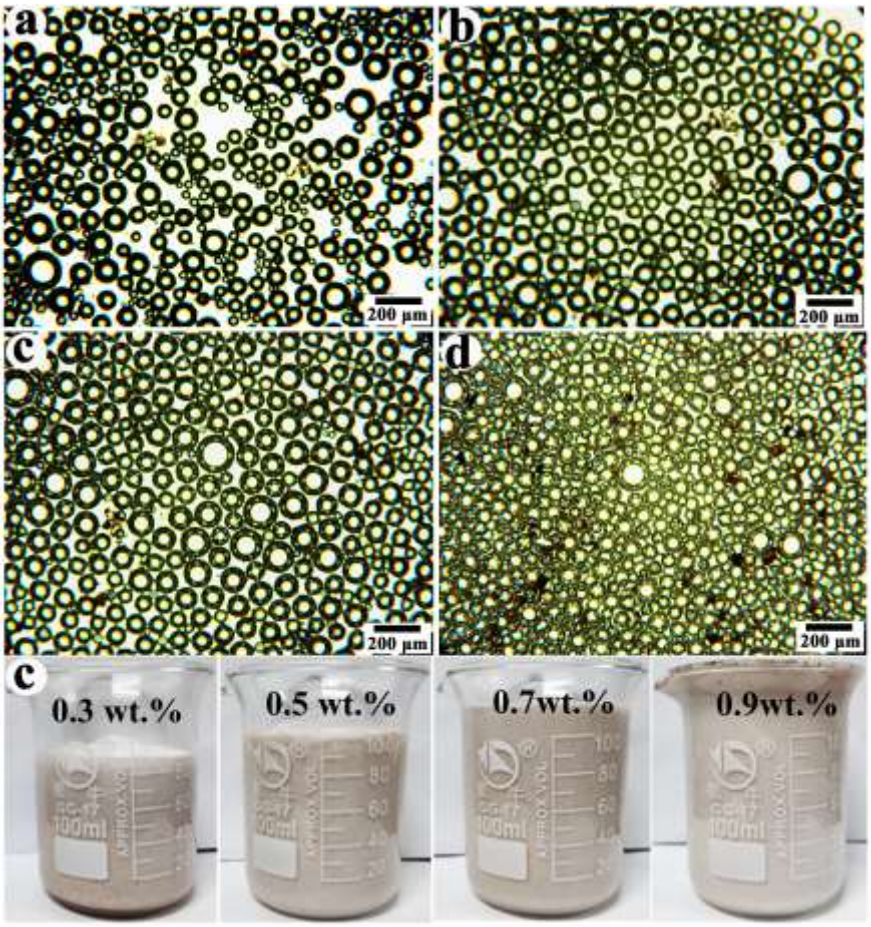

Fig. S1 Optical microscope pictures of foam stabilized by 3 % COSSC and different concentrations of SMP (a) 0.3 wt.%, (b) 0.5 wt.%, (c) 0.7 wt.%, (d) 0.9 wt.%.

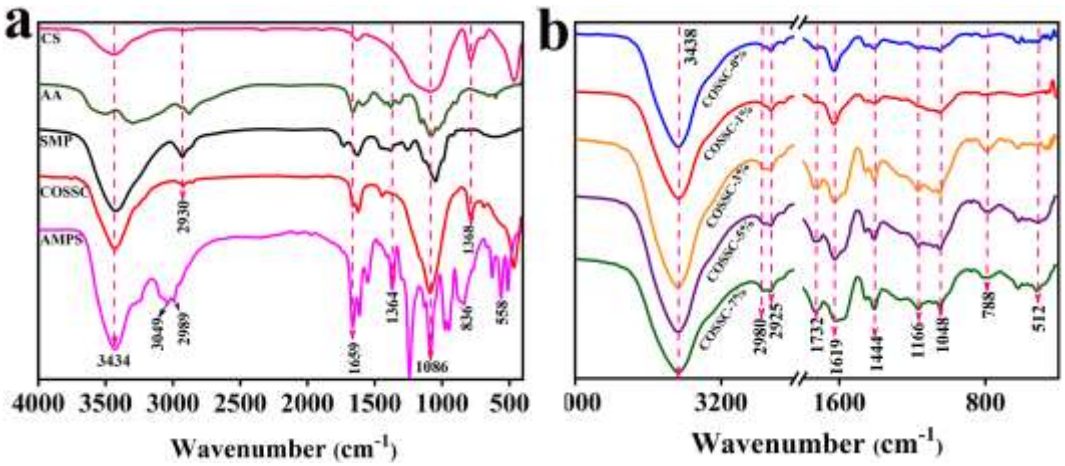

Fig. S2 FTIR of CS, AA, AMPS, COSSC, SMP, and CS-*g*-P(AA-co-AMPS)/SMP/COSSC (0 - 7%).

The chemical composition and structure of porous superabsorbent were further revealed by FTIR analysis. As can be seen from Fig. S2, the characteristic absorption peaks such as -OH group (3434 cm^{-1}), stretching vibration peak of $-CH_2$ (2989 cm^{-1}), the symmetric and antisymmetric vibration peaks of $-COO^-$ (1640 cm^{-1}) in CS FTIR spectrum Fig. S2a. The absorption peak at 1570 cm^{-1} after polymerization is attributed to -COO- of PAA, and the absorption peak at 1260 cm^{-1} is attributed to the bending and stretching vibrations of C-N, indicating that CS-*g*-PAA has been successfully formed. After adding AMPS, we found that the absorption peaks located at 1658 cm^{-1}, 1553 cm^{-1} and 1218 cm^{-1} are the characteristic absorption peaks of C=O stretching, N-H bending and S=O stretching [1, 2], which can further indicate that AMPS participates in the polymerization reaction. For the COSSC added samples (CS-*g*-P(AA-co-AMPS)/SMF/COSSC), a significant decrease in the absorption peaks of Si-OH and Si-O-Si at 1048 and 468 cm^{-1} was clearly observed. It may be that Si-OH in COSSC can form hydrogen bonds with hydrophilic groups (-COOH, NH_2, $-SO_3$, etc) in the polymerization system Fig. S2b. The above FTIR experimental data provide clear evidence for the graft copolymerization of AA and AMPS on chitosan chains.

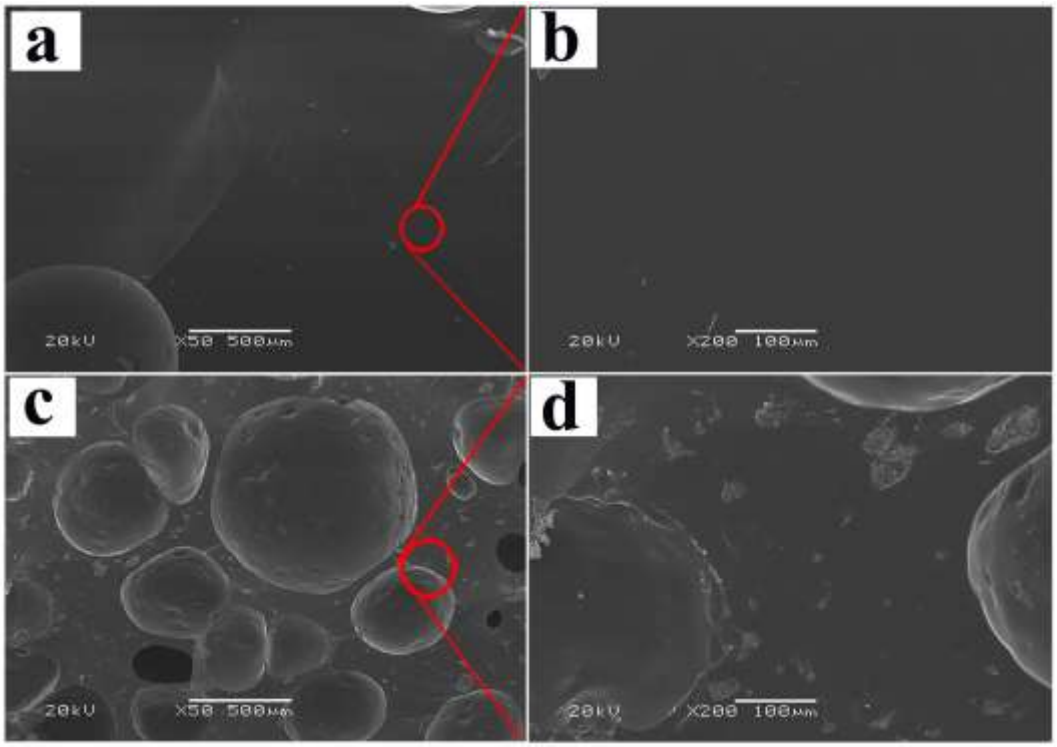

Fig. S3 SEM images of CS-*g*-P(AA-co-AMPS)/SMP (a, b) and CS-*g*-P(AA-co-AMPS)/SMF/COSSC by conventional redox polymerization (without foaming) (d, c).

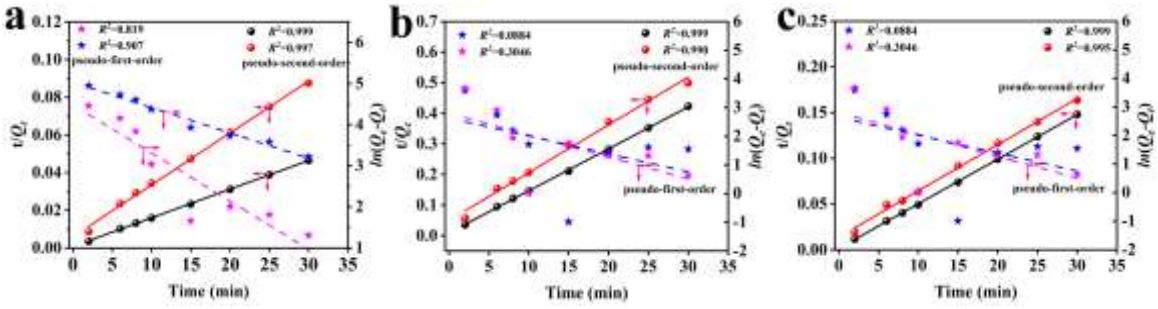

Fig. S4 Fitting curves in distilled water (a), 0.9 wt.% NaCl solution (b), and in tap water (c), Other test conditions are as follows: (m_{sample} = 0.05 g; VH2O, 400 mL; pH = 7; Time = 4 h).

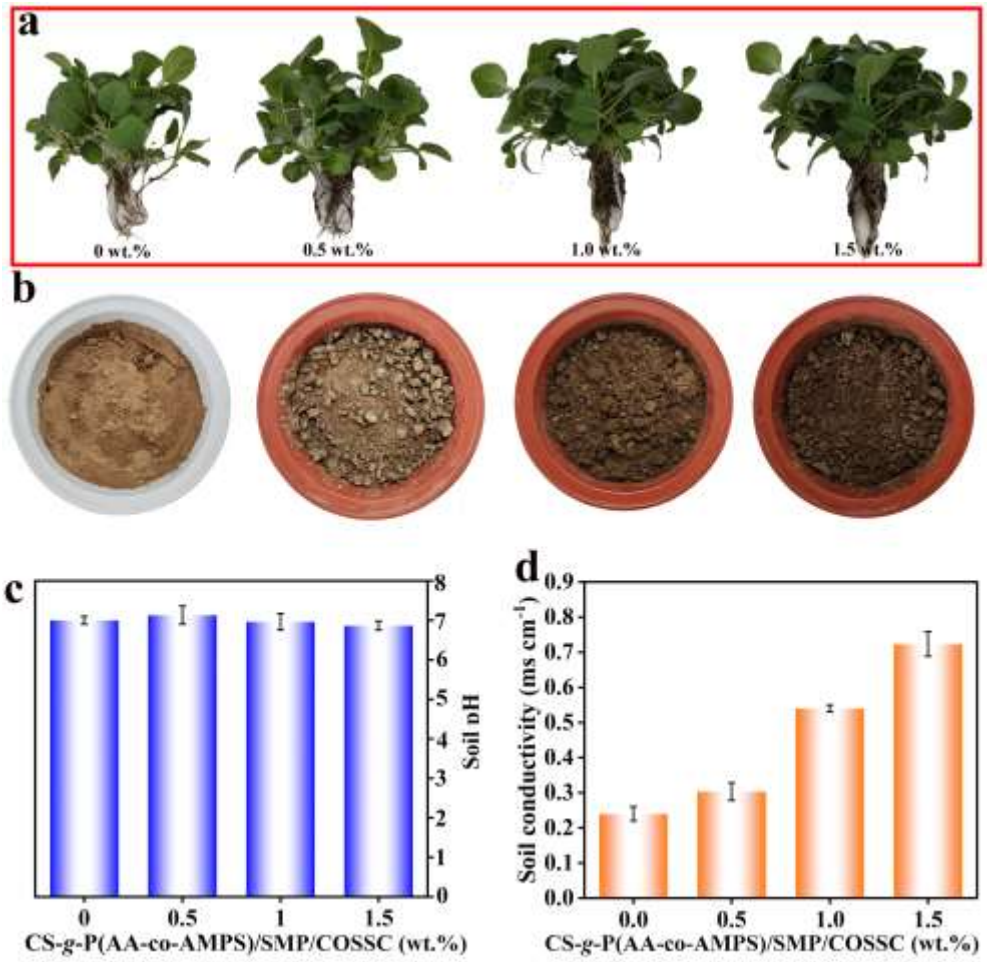

Fig. S5 Digital photographs of cabbage seeds with different CS-*g*-P(AA-co-AMPS)/SMP/COSSC (a); Soil aridity under, soil pH and soil conductivity under different CS-*g*-P(AA-co-AMPS)/SMP/COSSC additions (b), (c) and (d).

Table S1 Swelling kinetic parameters of CS-*g*-P(AA-co-AMPS)/SMP/COSSC in distilled water, 0.9 wt.% NaCl solution and in tap water.

Sample	In distilled water		In 0.9 wt.% NaCl		In tap water	
	q_{cal} (g/g)	$K_1 \times 10^{-3}$ (g/g·min)	q_{cal} (g/g)	$K_1 \times 10^{-3}$ (g/g·min)	q_{cal} (g/g)	$K_1 \times 10^{-3}$ (g/g·min)
No forming	363.636	1.189	64.102	4.876	198.019	1.817
Pickering foam template	657.894	2.901	72.886	19.88	205.338	14.550

Table S2 Diffusion parameters of CS-*g*-P(AA-co-AMPS)/SMP/COSSC in distilled water, 0.9 wt.% NaCl solution and in tap water.

Sample	In distilled water		In 0.9 wt.% NaCl		In tap water	
	Intercept *lnk*	slope *n*	Intercept *lnk*	slope *n*	Intercept *lnk*	slope *n*
No forming	4.481	0.117	2.372	0.105	2.803	0.0764
Pickering foam template	5.035	0.061	0.097	2.505	2.634	0.0626

Table S3 Germination of cabbage at different CS-*g*-P(AA-co-AMPS)/SMP/COSSC additions.

CS-*g*-P(AA-co-AMPS)/SMP/COSSC	Germination rate	
	3 Day	5 Day
0 wt.%	68.71%	89.71%
0.5 wt.%	68.28%	89.92%
1.0 wt.%	72.00%	91.07%
1.5 wt.%	71.42%	92.85%

Table S4 Chlorophyll content (mg/g fresh leaves) in cabbage seed.

Samples	Chlorophyll a	Chlorophyll b	Chlorophyll a + b
Control	**21.0789**	**11.7391**	**32.8080**
0.5 wt.%	**21.1950**	**12.6337**	**33.8287**
1 wt.%	**22.0922**	**12.5085**	**34.6007**
1.5 wt.%	**23.000**	**12.8311**	**35.8311**

Reference:

1 Y. Bao, J. Ma and N. Li, *Carbohydr. Polym.* 2011, **84** (1), 76-82.

2 Y. Guo, R. Guo, X. Shi, S. Lian, Q. Zhou, Y. Chen, W. Liu and W. Li, *Int. J. Biol. Macromol*. 2022, **209** (Pt A), 1169-1178.