Supplementary material

Improvement of sludge dewatering by calcium peroxide activated with pyrite: performances, mechanisms and implications

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Text S1 The method of EPS extraction and analysis

In this study, a heat extraction method was modified to extract EPS. Firstly, 30mL sludge sample was placed in centrifuge tube, after centrifuged at 4000g for 5min, the centrifugal supernatant was stored as S-EPS. The precipitate was resuspended into 10mL of 0.05% NaCl solution, afterwards, the sludge mixture was diluted with the NaCl solution to 30mL. The NaCl solution for dilution was pre-heated to 70℃. The 30mL sludge mixture was sheared by a vortex mixer for 1min immediately, then the mixture was centrifuged at 4000g for 10 min, the supernatant was collected as LB-EPS extraction of sludge. After LB-EPS extraction, the sludge pellet left was resuspended in 0.05% NaCl solution to 30mL. The sludge suspension was heated to 60℃ in a water bath for 30min, and the sludge mixture was then centrifuged at 4000g for 15min. The supernatant that was collected as the TB-EPS extraction of the sludge.

Text S2 Bound water content measurement

In this experiment, 30 mL sludge samples were centrifuged at 1057g for 10 min, and then the sludge at the bottom was collected. The water content of sludge samples collected in the previous step was measured by drying at 105℃ overnight, and this water content was defined as bound water content.

Text S3 The analysis method of protein secondary structure

In this study, the protein secondary structure was divided into four types, α-helix, β-sheet, β-turn and random coil. The content of each secondary structure in sludge samples were calculated by the peak area of infrared amide I region (1600-1700cm^{-1}). The contents of α-helix, random coil, β-sheet and β-turn were calculated by the peak integral of amide I region in FTIR spectrum.

Table S1 Conditioning parameters of CaO_2/pyrite composite conditioning

Conditioning scheme	Pyrite dose （mg/g TS）	CaO_2 dose (mg/g TS)	Conditioning time (h)
PY	32.61	0	1
A30	0	30.00	1
A100	0	100.00	1
B30	32.61	30.00	1
B100	32.61	100.00	1

Table S2 Wavelength and type of peaks in 3D-EEM

	Ex	**Em**	Type of substance
Peak A	280	360	tyrosine & like substances
Peak B	220	360	Aromatic protein II

Table S3 The information of peaks in FTIR spectral peak

Wave number（cm^{-1}）	functional group
990，1074~1102	C-O
1401~1409	C=C
1640	C=O
2420/2968/3144	C-H
3437~3434	O-H

Table S4 The wavenumber of protein secondary structure in amide I region

	amide I region			
Protein secondary Structure	α-helix	β-sheet	β-turn	random coil
Wavenumber (cm^{-1})	1646-1664	1615-1637/ 1682-1700	1664-1681	1637-1645

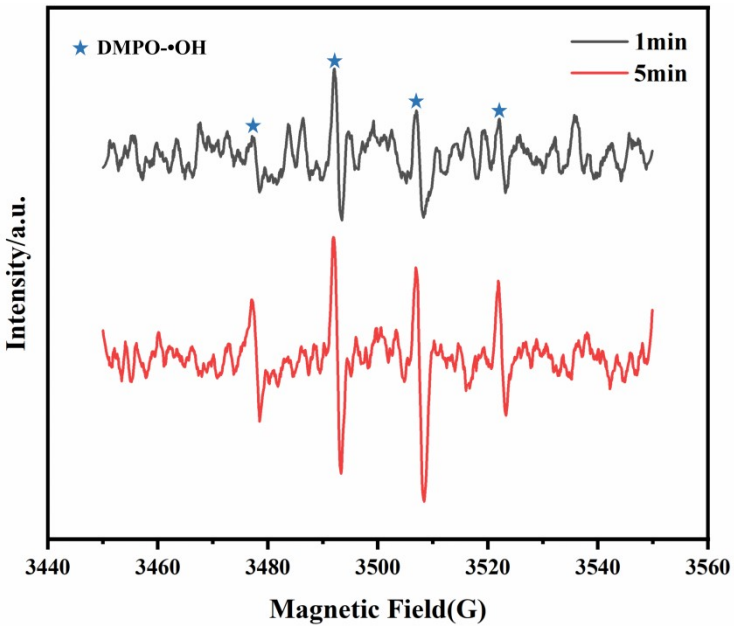

Fig.S1 The EPR results of CaO_2 activated by pyrite

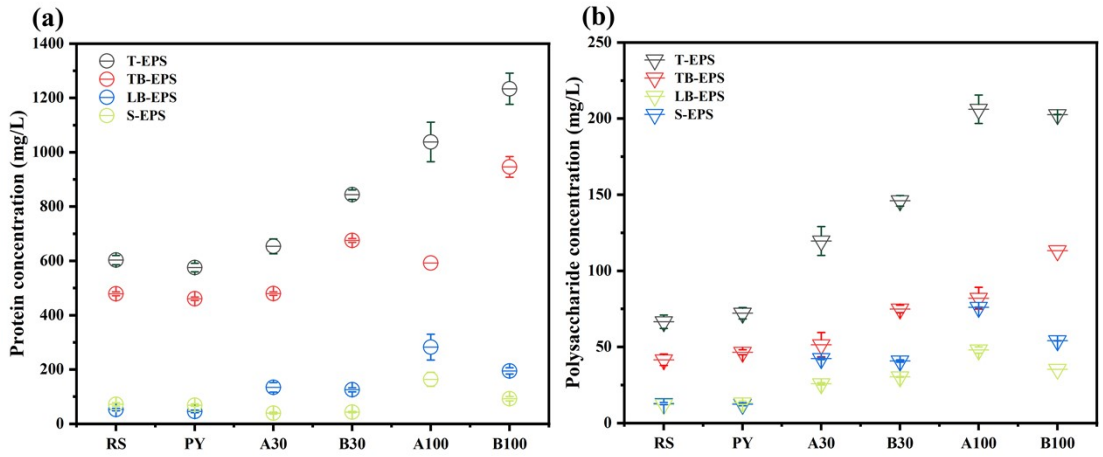

Fig.S2 The contents of (a) protein and (b) polysaccharide in EPS of samples conditioned by different conditioning schemes

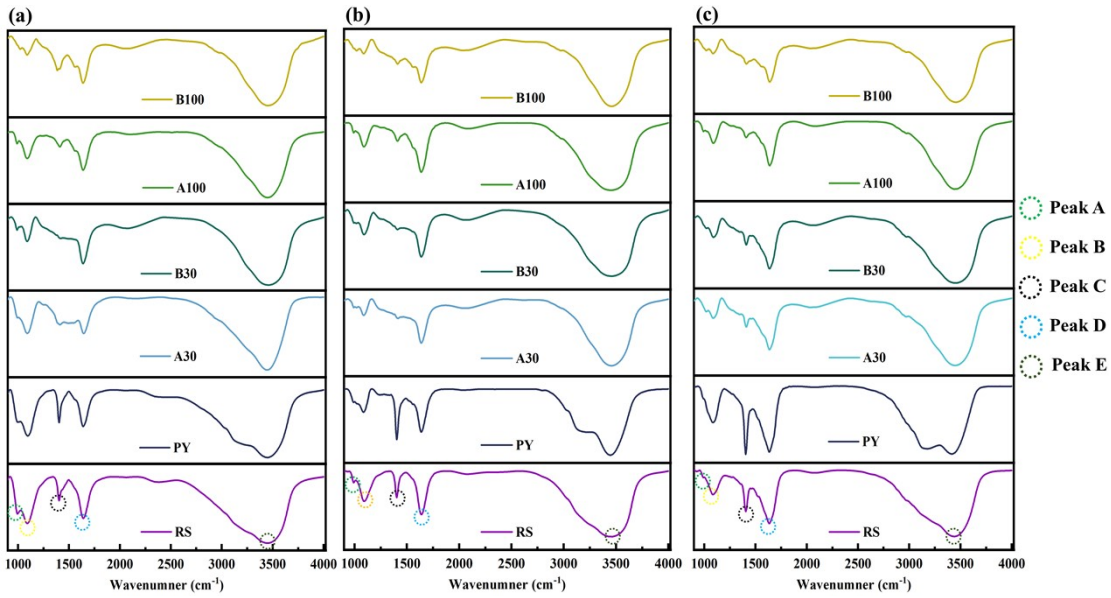

Fig.S3 FTIR results of (a) S-EPS, (b) LB-EPS and (c) TB-EPS conditioned by different conditioning schemes

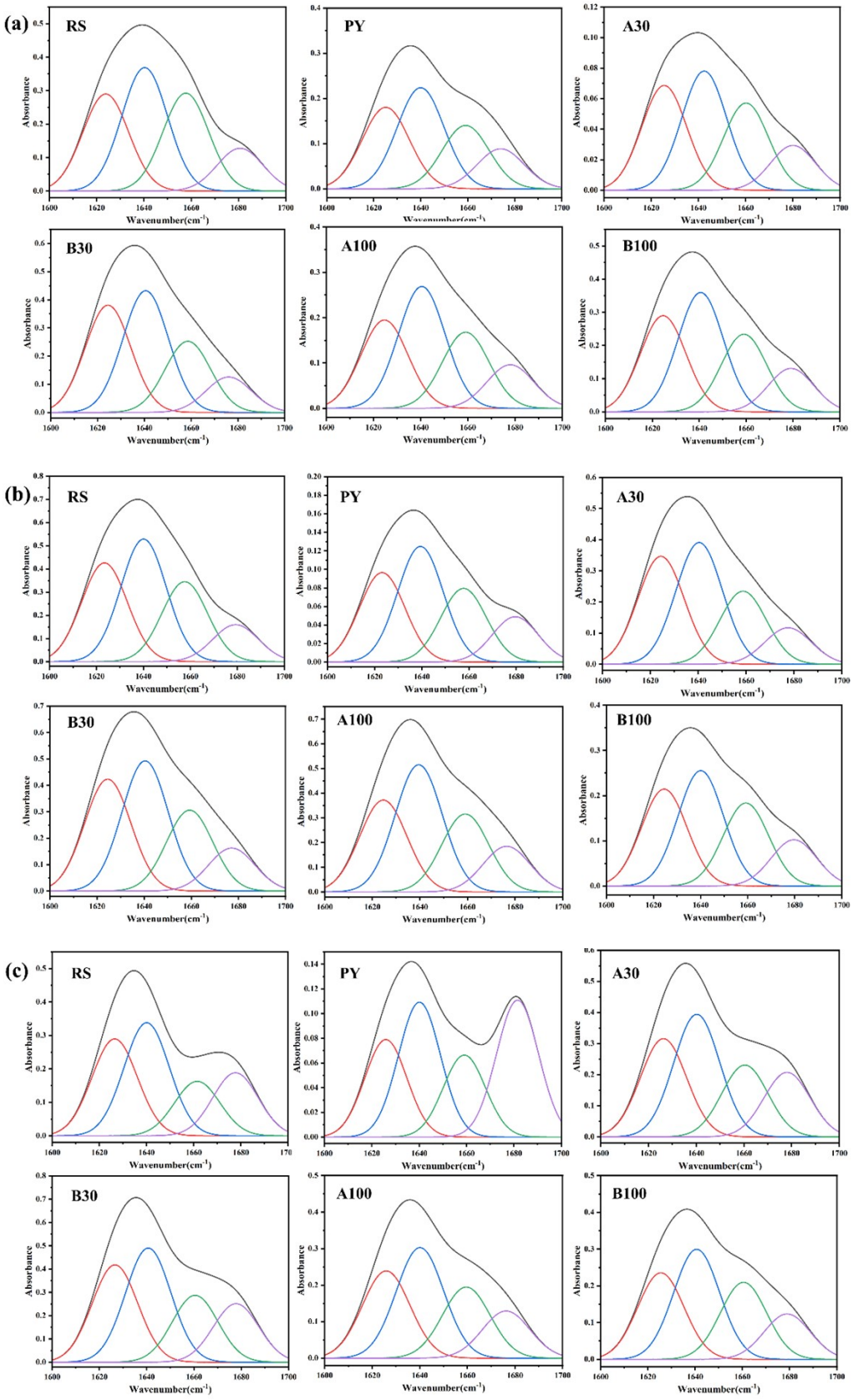

Fig.S4 FTIR peak integration results of (a) S-EPS, (b) LB-EPS and (c) TB-EPS conditioned by different conditioning schemes

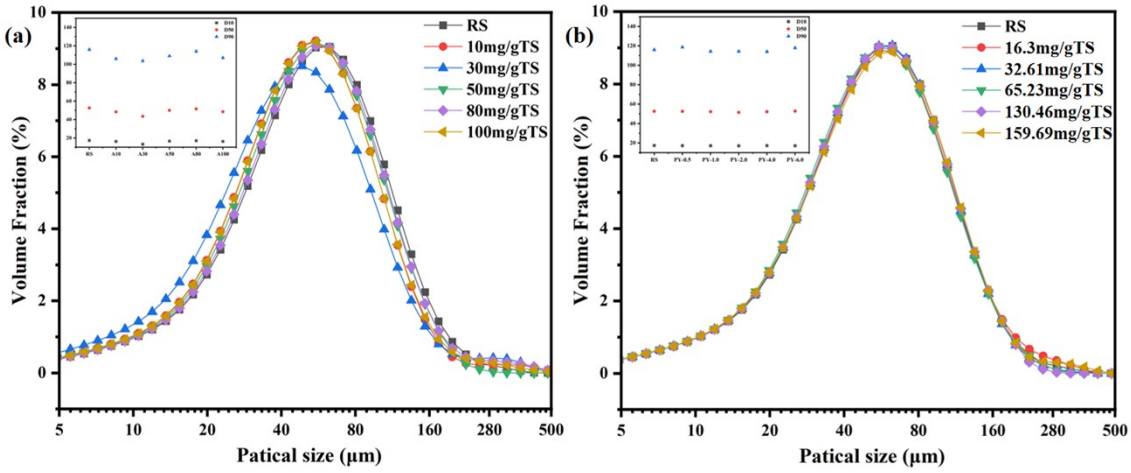

Fig.S5 Particle size distribution of sludge samples conditioned by (a) CaO2 and (b) pyrite.

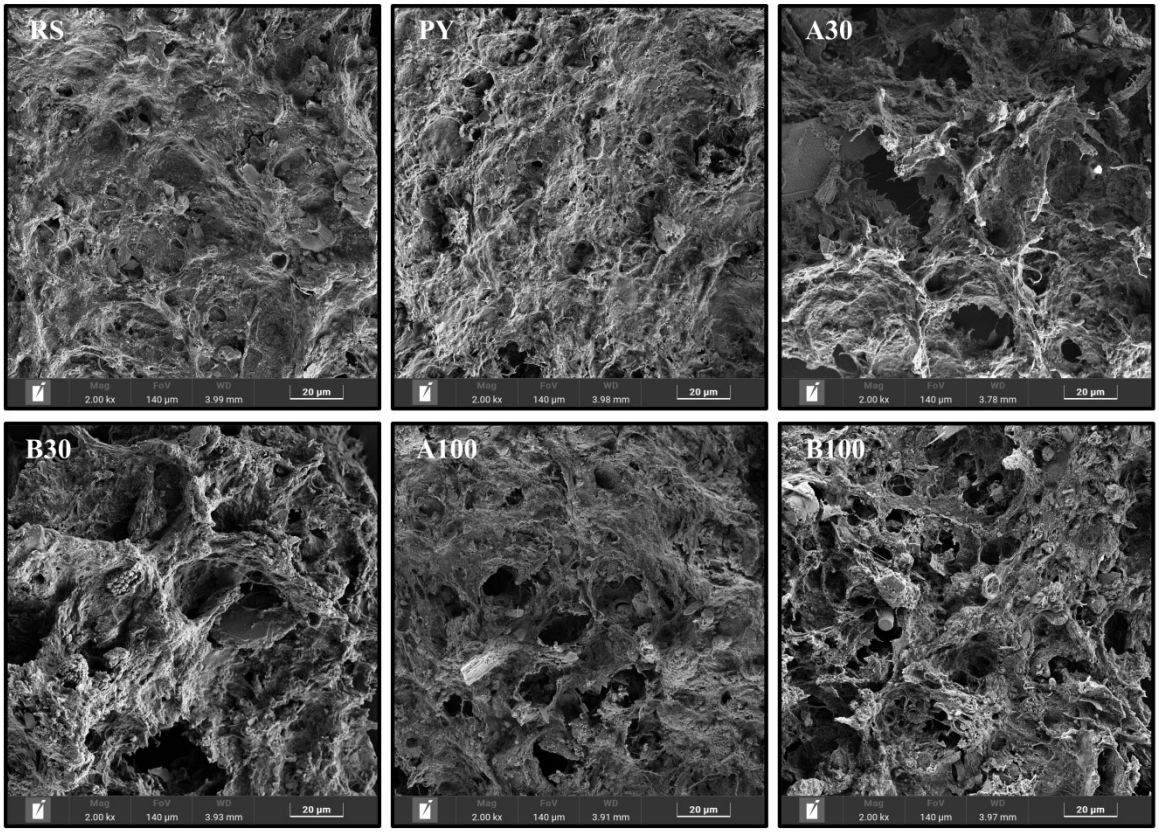

Fig.S6 SEM of RS and sludge samples conditioned by different schemes