Supporting Information

Sol-gel hydrothermal synthesis of microstructured CaO-based adsorbents for CO_2 capture

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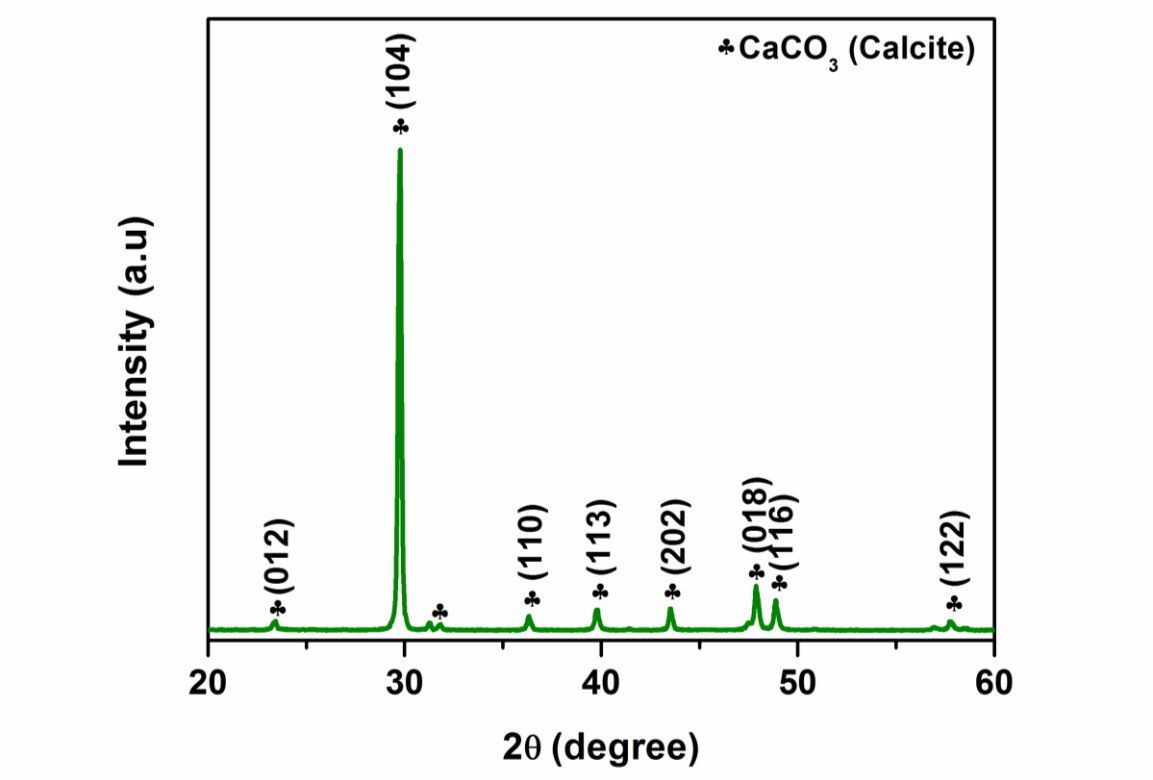

Fig. S1 XRD pattern of limestone ($CaCO_3$).

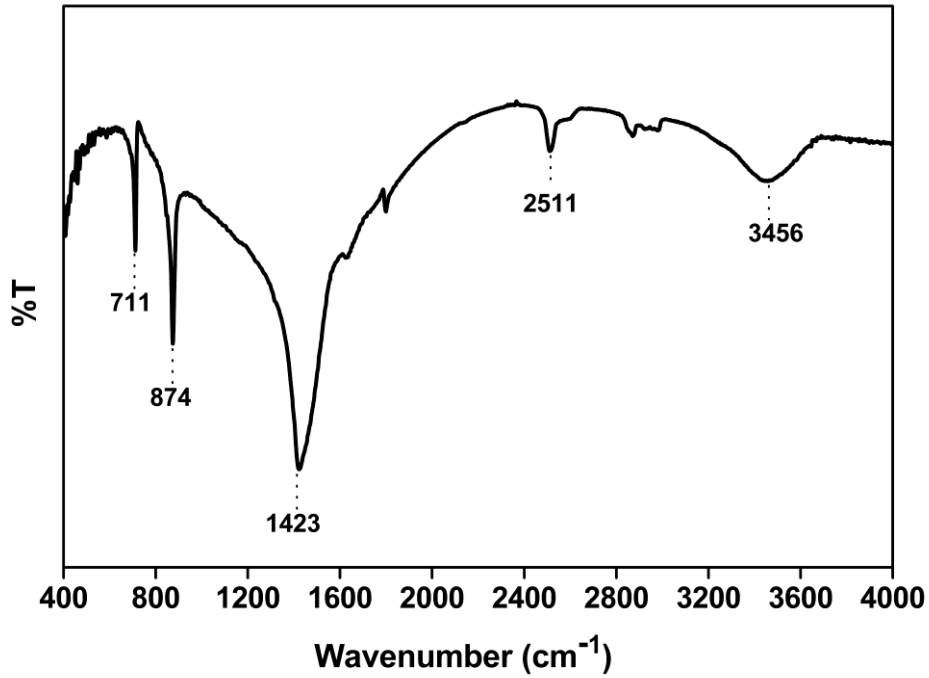

Fig. S2 FTIR spectrum of 3D hierarchical $CaCO_3$ hollow microspherical adsorbent composed of 1D spike-shaped nanorods

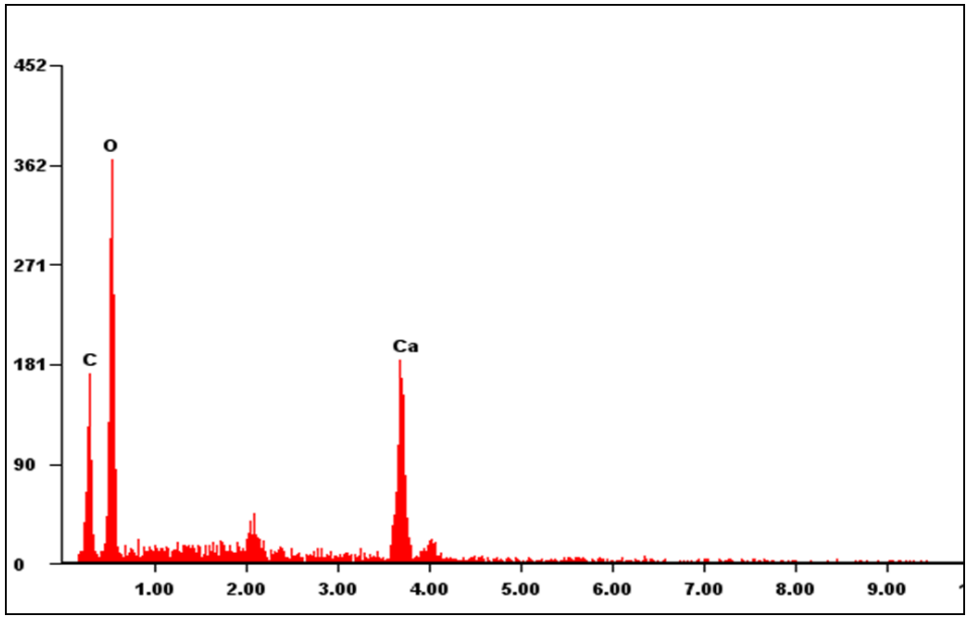

Fig. S3 EDX spectrum of 3D hierarchical $CaCO_3$ hollow microspherical adsorbent composed of 1D spike-shaped nanorods

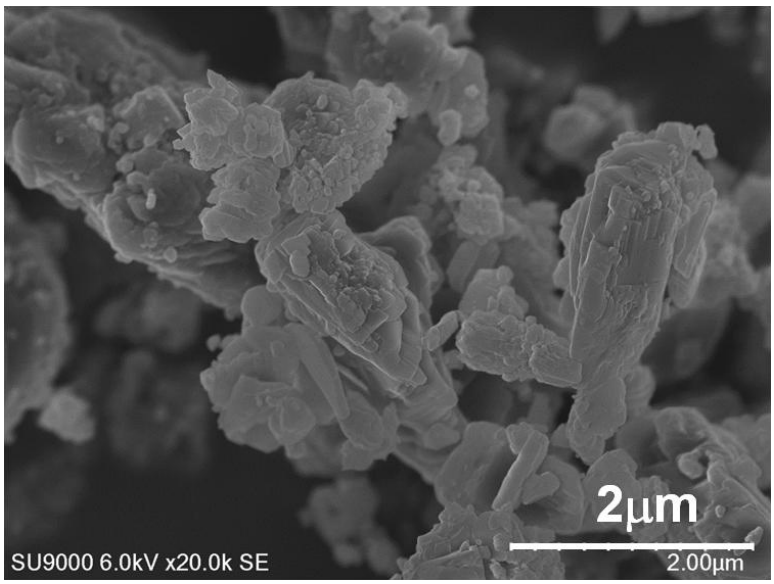

Fig. S4 FESEM image of the commercial limestone ($CaCO_3$) from Malaysia.

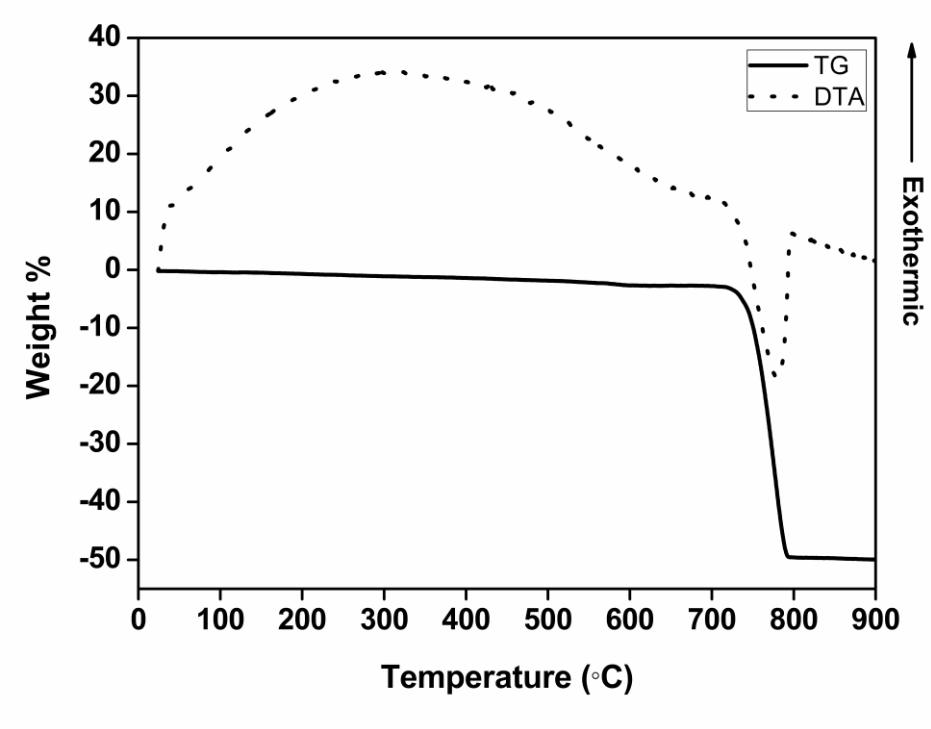

Fig. S5 TG–DTA curves of 3D hierarchical $CaCO_3$ hollow microspherical adsorbent composed of 1D spike-shaped nanorods

Table S1 BET surface areas and crystallite sizes of synthesized adsorbents under different NaOH concentrations.

Adsorbents	BET (m^2/g)	Crystallite sizes (nm)
$CaCO_3$ (2 M NaOH)	44.85	76.75
$Ca(OH)_2$ (6 M NaOH)	19.49	44.69
$CaC_2O_4.H_2O$ (10 M NaOH)	7.87	37.12

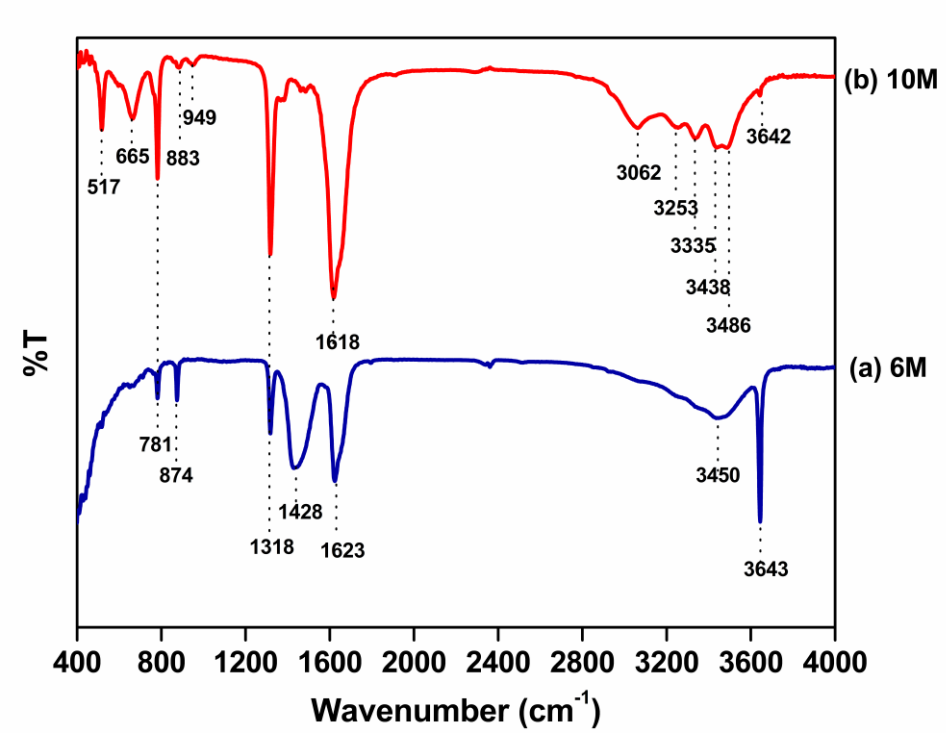

Fig. S6 FTIR spectra of $Ca(OH)_2$ and $CaC_2O_4.H_2O$ adsorbents synthesized with (a) 6 M and (b) 10 M NaOH.

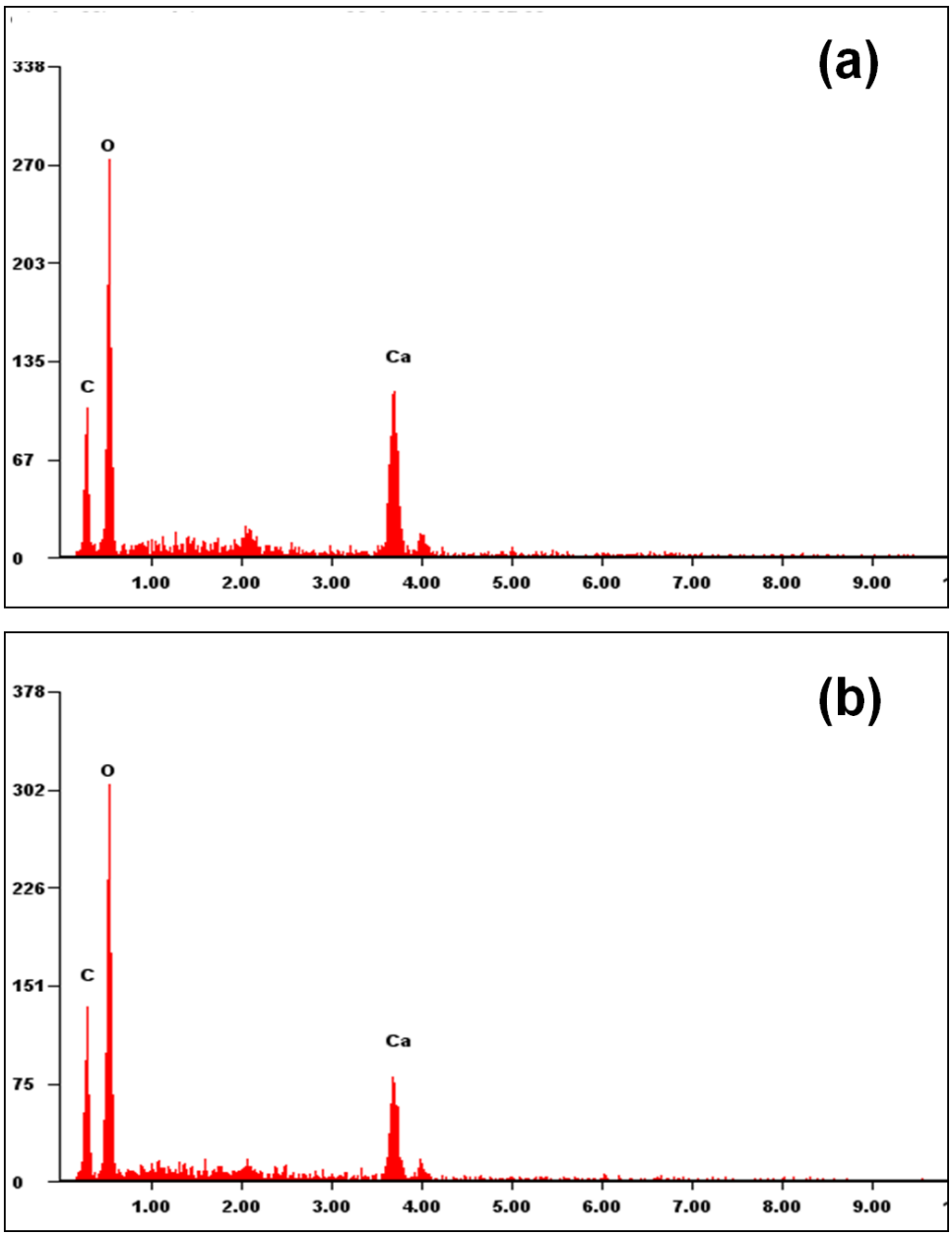

Fig. S7 EDX spectra of $Ca(OH)_2$ and (b) $CaC_2O_4.H_2O$ adsorbents synthesized with (a) 6 M and (b) 10 M NaOH.

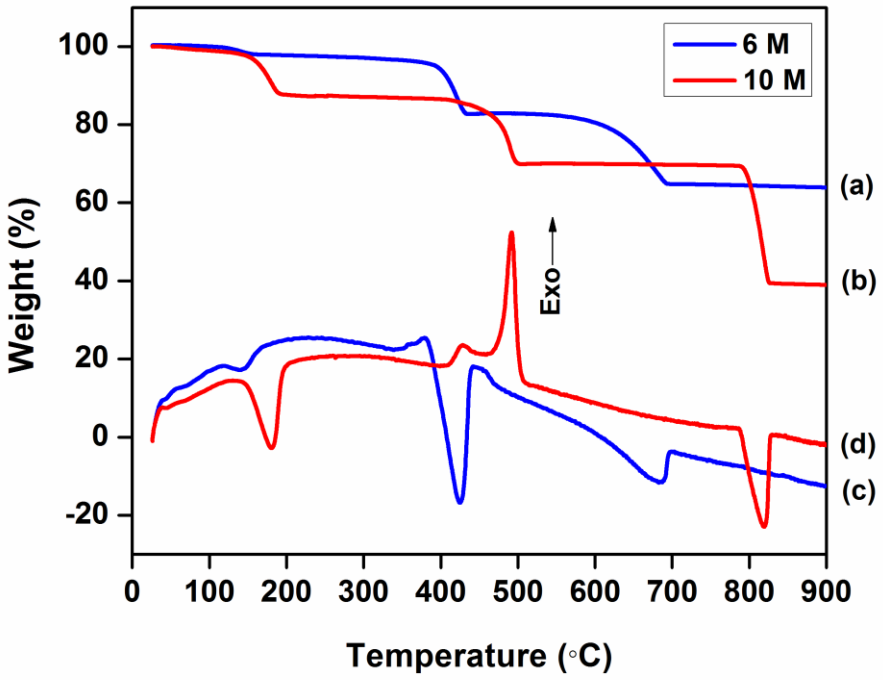

Fig. S8 TG-DTA curves of $Ca(OH)_2$ and $CaC_2O_4.H_2O$ adsorbents synthesized with 6 and 10 M NaOH.

Table S2 TG data of $Ca(OH)_2$ and $CaC_2O_4.H_2O$ adsorbents.

Adsorbents	**TG Weight loss (%)**		
	Step I (100–190 °C)	**Step II (370–510 °C)**	**Step III (560–830°C)**
$Ca(OH)_2$ (6 M NaOH)	2.1	15.3	17.7
$CaC_2O_4.H_2O$ (10 M NaOH)	10.5	16.3	30.0

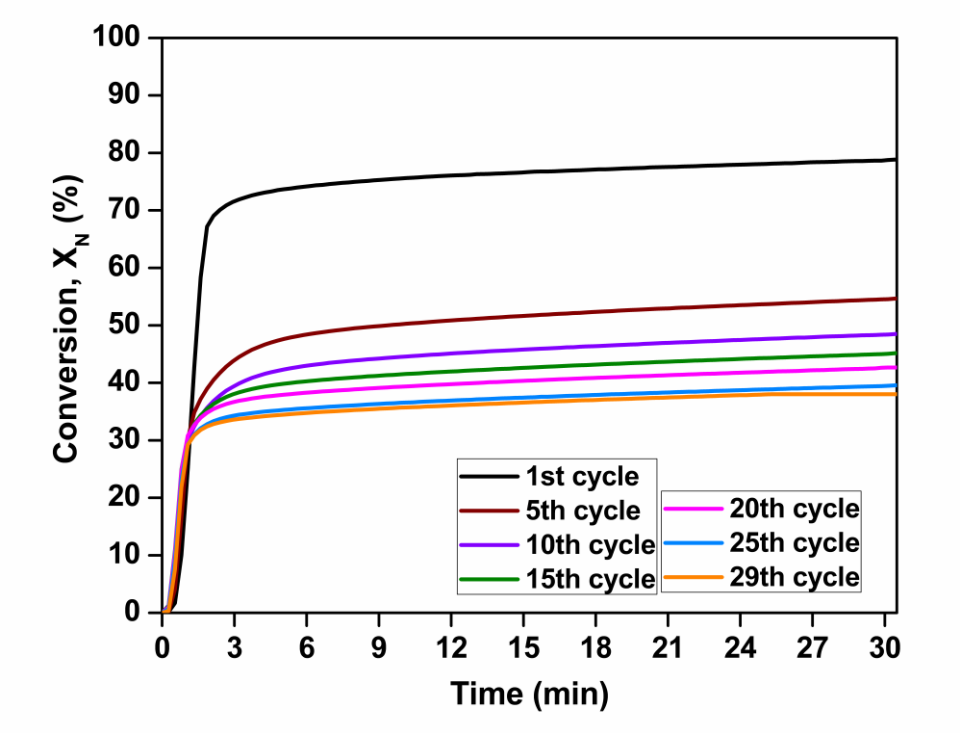

Fig. S9 Multi cycles carbonation conversion curves of 3D hierarchical $CaCO_3$ hollow microspherical adsorbent composed of 1D spike-shaped nanorods

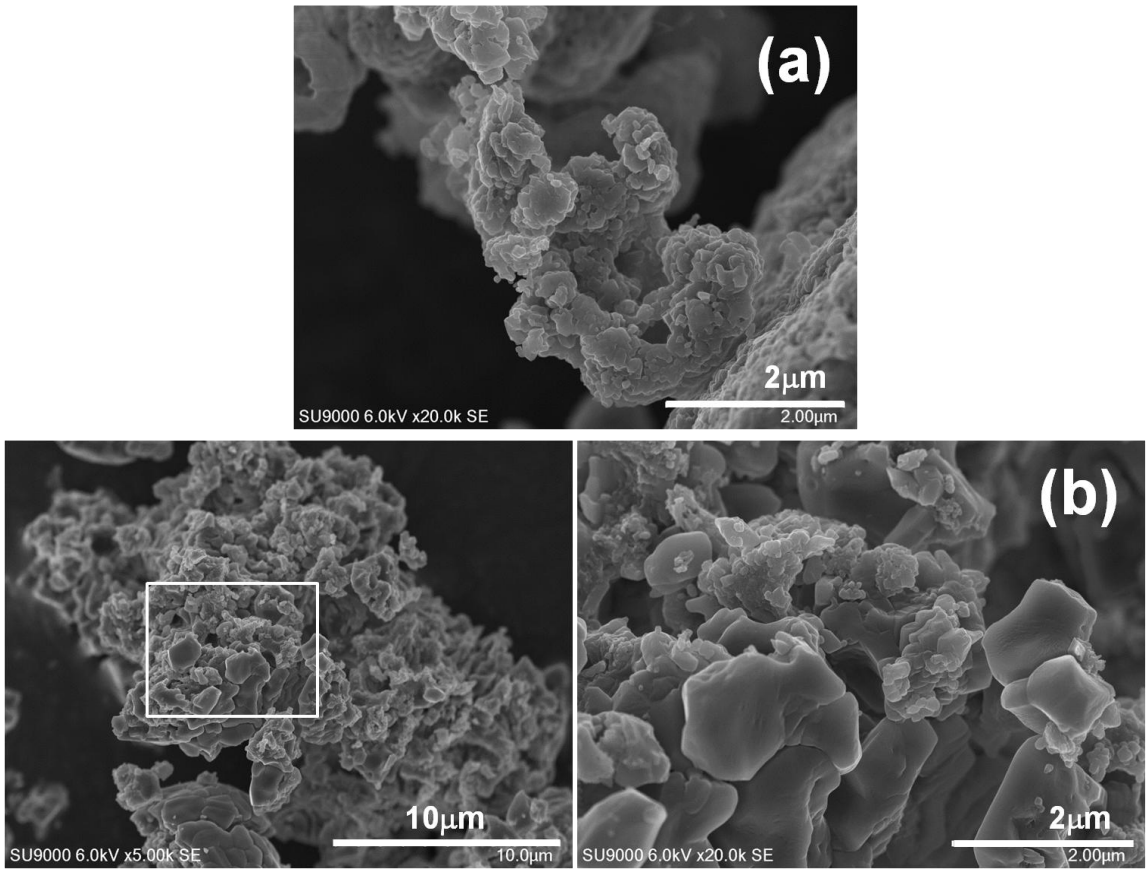

Fig. S10 FESEM images of the calcined 3D hierarchical $CaCO_3$ hollow microspherical adsorbent composed of 1D spike-shaped nanorods (a) after 1cycle (b) after 29 cycles.

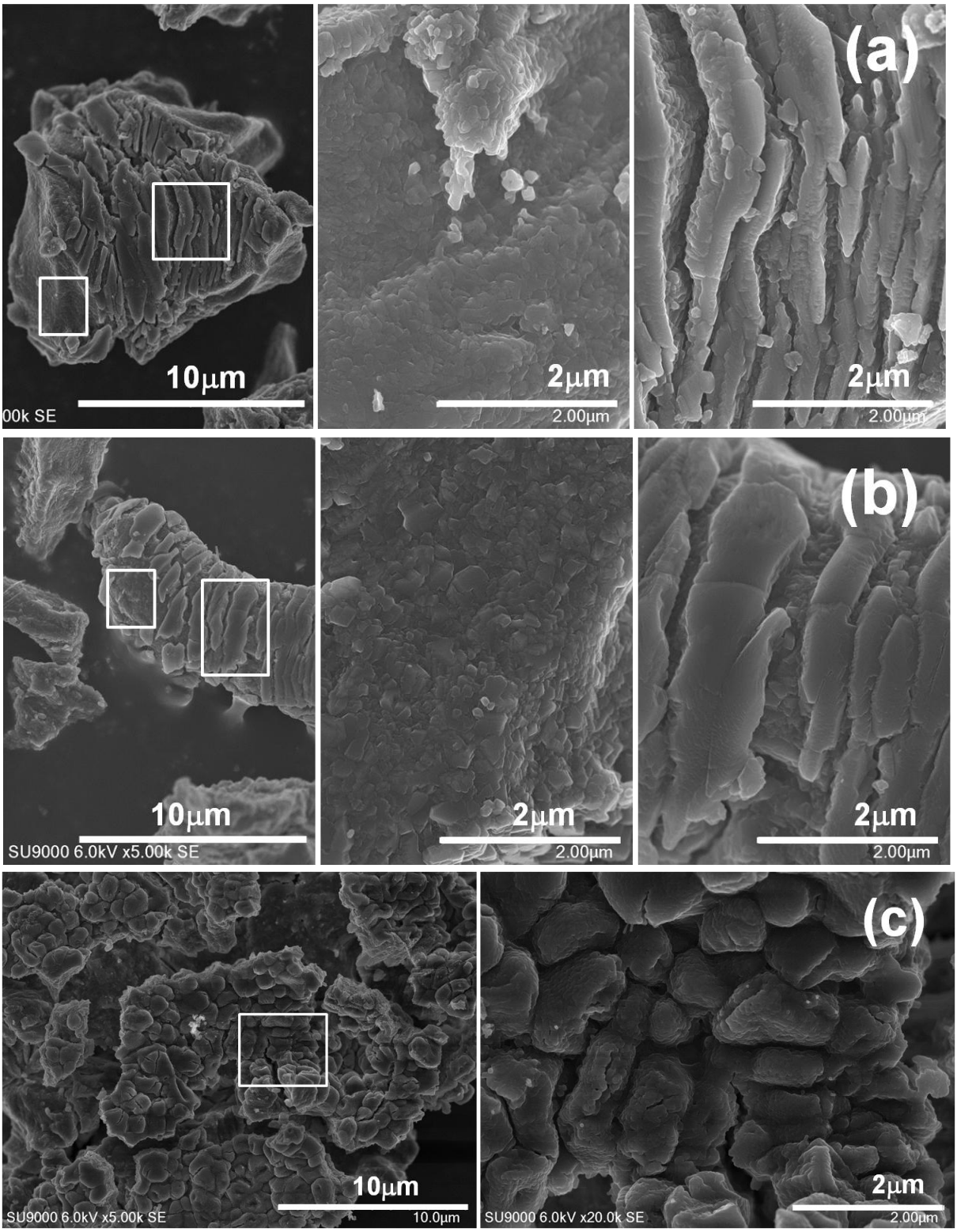

Fig. S11 FESEM images of the calcined adsorbents after 15 cycles (a) $Ca(OH)_2$, (b) $CaC_2O_4.H_2O$ and (c) limestone.