Rapid Synthesis of MOF CaBTC using an ultrasonic irradiation method and its derivative materials for CO_2 capture

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Supplementary Information

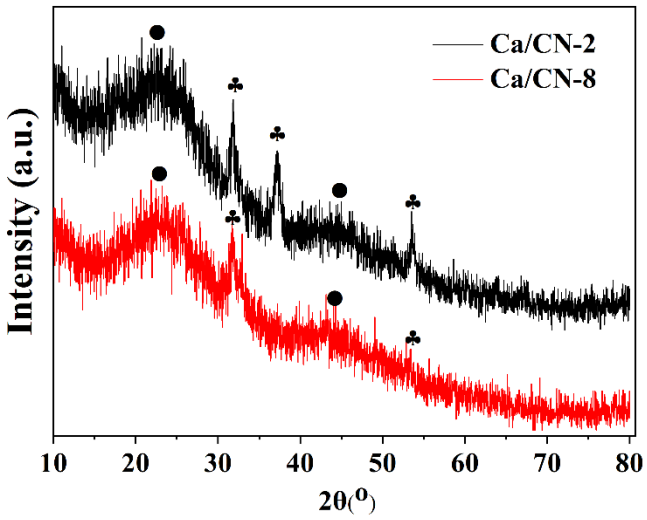
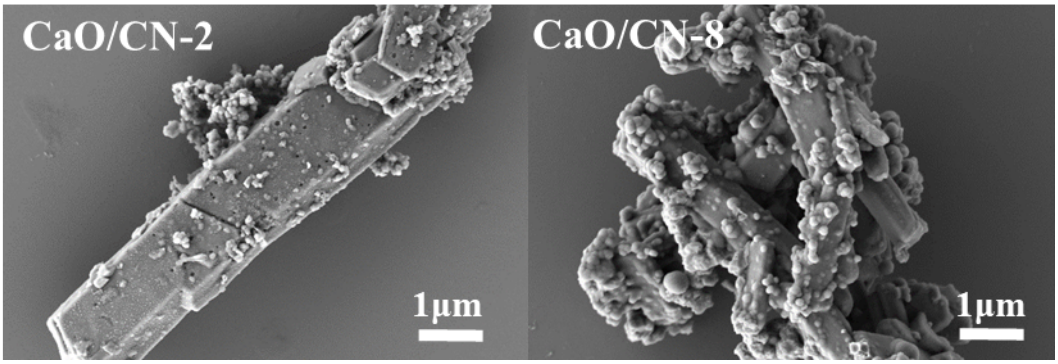


Figure S1: XRD patterns of Ca/CN-2 and Ca/CN-8(♣ CaO ● C)



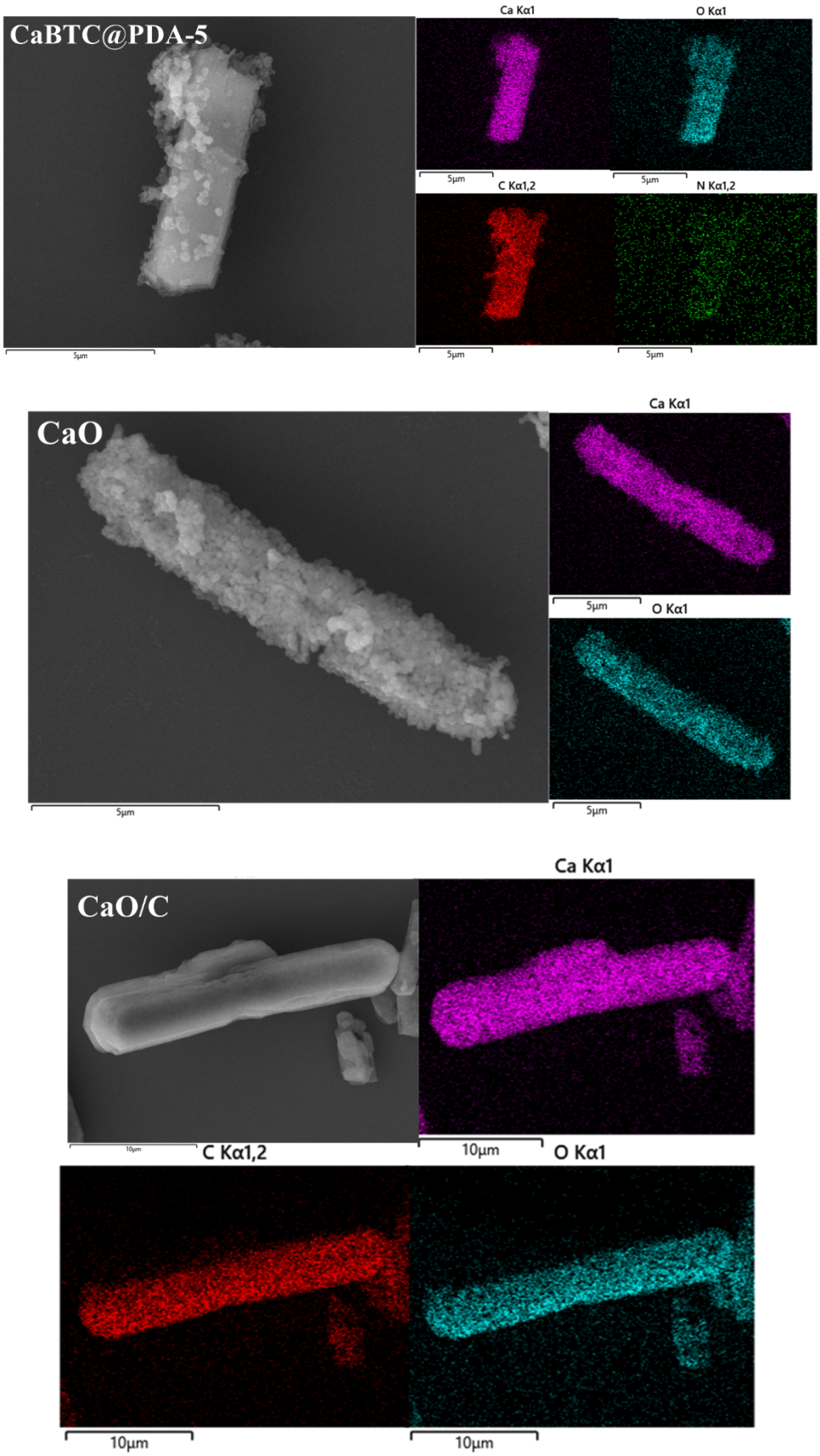


Figure S2: SEM images of Ca/CN-2 , Ca/CN-8, CaBTC@PDA-5, CaO, CaO/C and elements mapping (Ca, O, C, N) for CaBTC@PDA-5, CaO, CaO/C

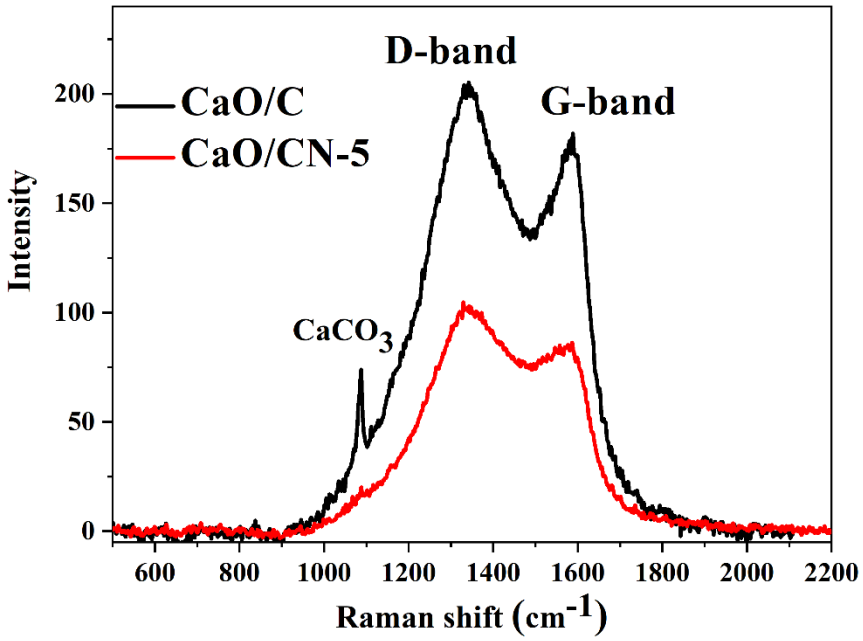


Fig. S3: Raman spectra of CaO/C and CaO/CN-5.

Fig. S3 presents the Raman spectra of CaO/C and CaO/CN-5. As shown in Fig. S3 (a), the Raman spectrum of CaO/C exhibited two adsorption peaks at 1340 cm^{-1} and 1586 cm^{-1}, which were attributed to the disordered carbon (D) band and graphite band (G), respectively [1]. The intensity ratio of I_D /I_G value was 1.13, and the sharp adsorption peak at 1083 cm^{-1} was assigned to calcium carbonate [2]. In addition, the adsorption peak of calcium carbonate was not detected in the CaO/CN-5 sample, and the other characteristic peaks of the CaO/CN-5 sample were consistent with those of the CaO/C sample. The intensity ratio of I_D /I_G value increased to 1.21. According to the above results, the CaO/C and CaO/CN-5 samples presented a certain degree of graphitization of the CaBTC MOF derivate obtained by the pyrolysis method.

References

[1] Wang J-G, Liu H-Z, Sun H-H, Hua W, Wang H-W, Liu X-R, Wei B-Q, One-pot synthesis of nitrogen-doped ordered mesoporous carbon spheres for high-rate and long-cycle life supercapacitors, Carbon 2018; 127, 85. https://doi.org/ 10.1016/j.carbon.2017.10.084.

[2] Schmid T, Dariz P, Shedding light onto the spectra of lime: Ramanand luminescence bands of CaO, $Ca(OH)_2$ and $CaCO_3$. J Raman Spectrosc 2015; 46, 141. https://doi.org/ 10.1002/jrs.4622.

Table S1. Elemental content of based on the evaluation of XPS spectra

Samples	C1s (At%)	Ca2p (At%)	O1s (At%)	N1s (At%)
CaBTC	61.01	5.72	33.27	—
CaBTC@PDA-5	60.69	1.39	23.27	14.65
Ca/CN-5	85.57	1.04	4.38	9.01
Ca/C	83.72	3.66	12.62	—

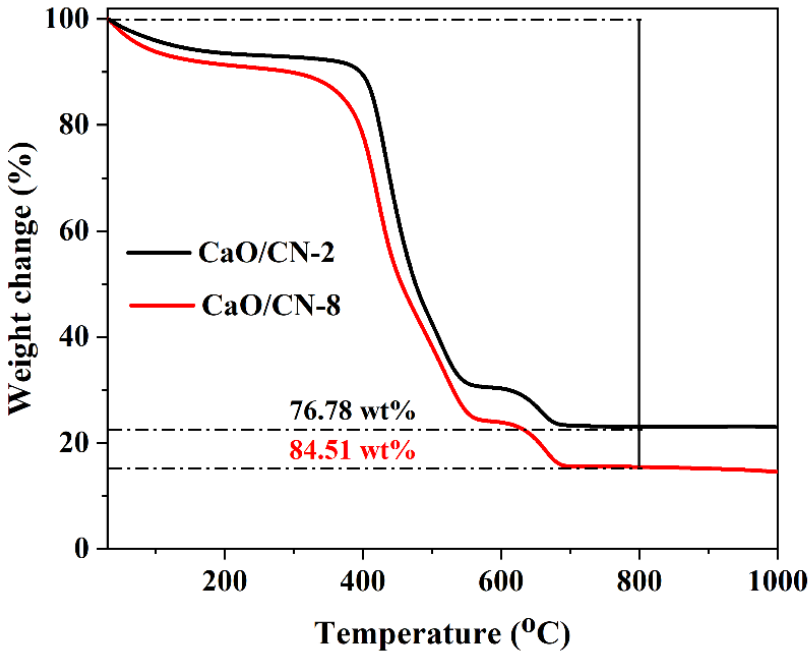


Fig. S4: TG curves of Ca/CN-2 and Ca/CN-8

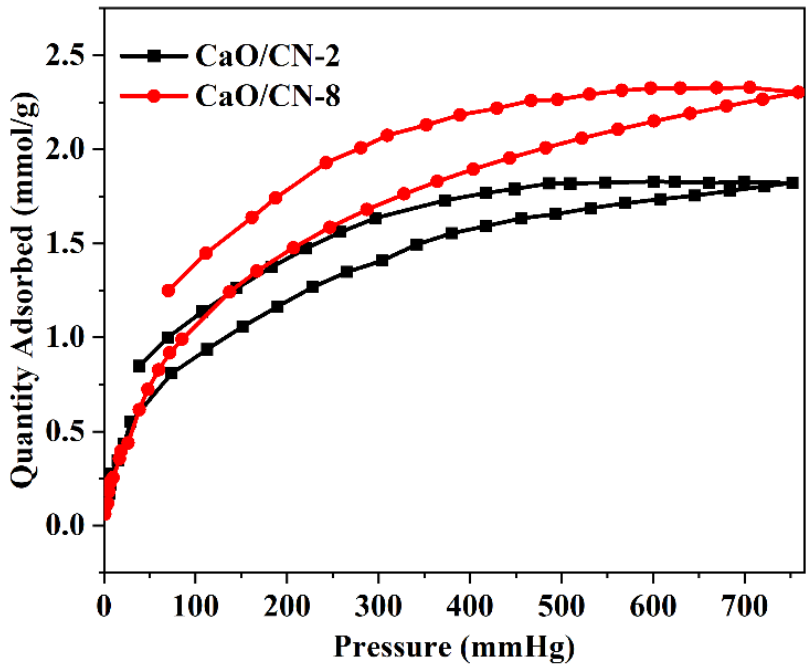


Fig. S5: CO_2 adsorption-desorption isotherms of Ca/CN-2 and Ca/CN-8