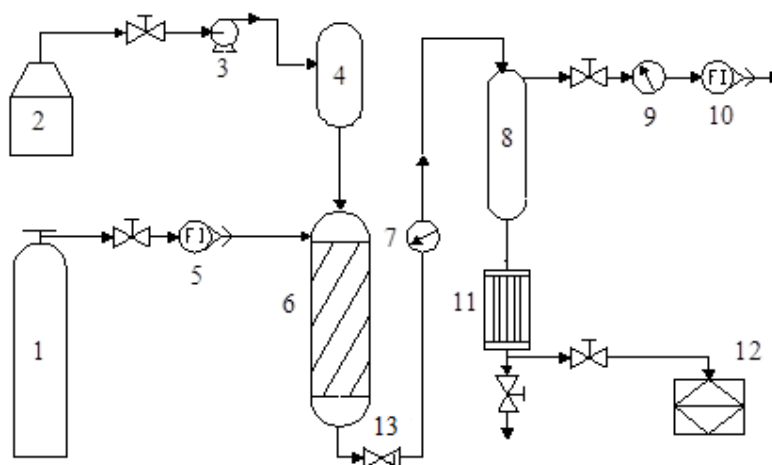


## Supplemental information

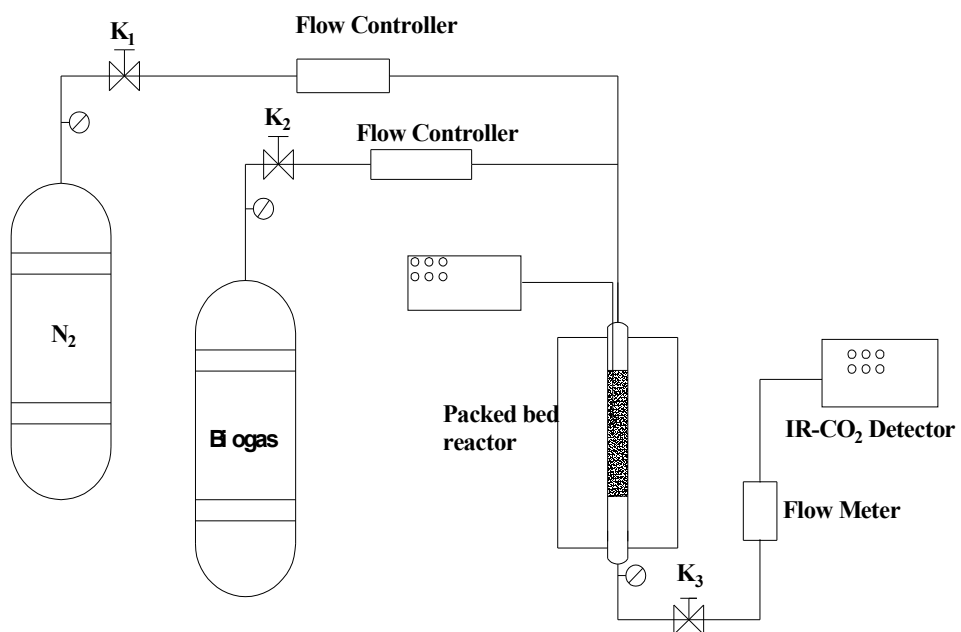
### Coconut Shell Activated Carbon Supported Quaternary Ammonium for Continuous Cycloaddition of CO<sub>2</sub> and Biogas Upgrading in a Packed Bed

Yilu Zhang, Yulian Zhang, Lei Wang, Hong Jiang, Chunrong Xiong\*

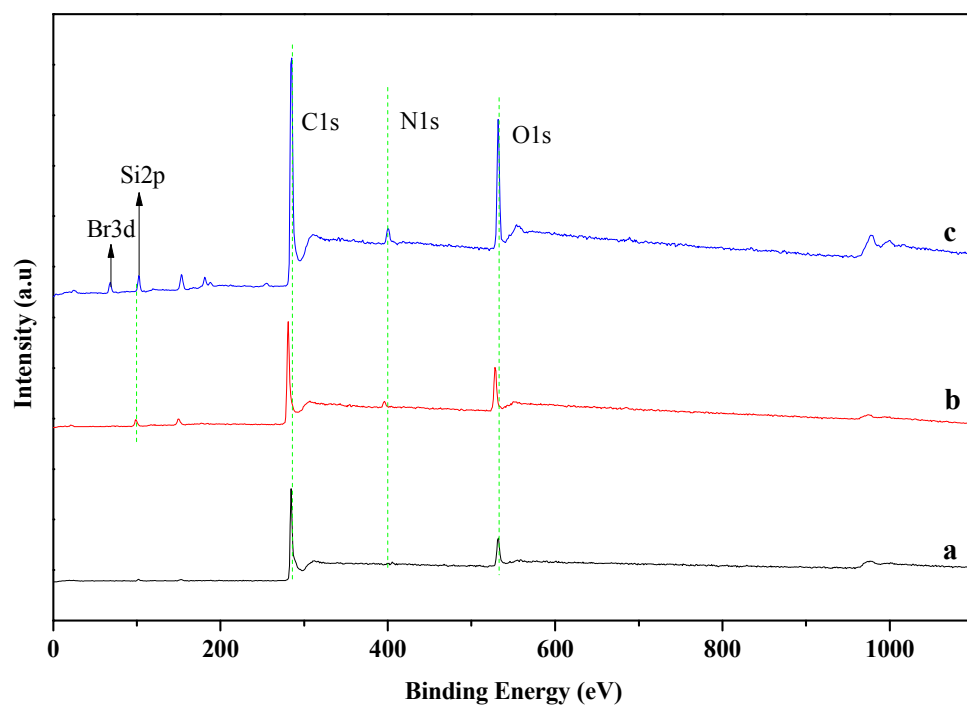
Special Glass Key Lab of Hainan Province, Hainan University, Hainan, Haikou  
570228, PR China.



**Figure S1.** Schematic diagram of continuous cycloaddition of CO<sub>2</sub> in a packed-bed reactor. 1-CO<sub>2</sub> cylinder; 2-raw material tank ; 3-advection pump; 4-preheating oven; 5,10-flowmeter; 6-packed-bed reactor; 7,9-pressure gauge; 8-gas-liquid separator; 11-condenser; 12-gas chromatograph; 13- counterbalance valve.



**Figure S2.** Schematic diagram of biogas upgrading in packed bed.



**Figure S3.** XPS spectra of the adsorbents. (a) Oxidized CSAC, (b)CSAC-[APTS], (c) CSAC-[APTS][Br].