

Supporting Information to:

**Assessing the Performance of Adsorbents for CO<sub>2</sub>/CH<sub>4</sub>**

**Separation in Pressure Swing Adsorption units: a**

**Review**

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**Table S1.** Activated carbons for CO<sub>2</sub>/CH<sub>4</sub> separation in pressure swing adsorption (PSA) units evaluated at T ≈ 25°C.

Sample / Precursor	Activation conditions			A <sub>BET</sub> (m <sup>2</sup> ·g <sup>-1</sup> )	V <sub>mic</sub> (cm <sup>3</sup> ·g <sup>-1</sup> )	Amount adsorbed (mol·kg <sup>-1</sup> ) for CO <sub>2</sub> =35%, CH <sub>4</sub> =65%		PSA performance parameters for: CO <sub>2</sub> =35%, CH <sub>4</sub> =65%		Ref.
	Time (min)	T (°C)	Agent			CO <sub>2</sub> - CH <sub>4</sub>		CO <sub>2</sub> /CH <sub>4</sub> Selectivity – PSA Working capacity (mol·kg <sup>-1</sup> )		
						P=5 bar	P=1 bar	P <sub>ads</sub> =5 bar P <sub>des</sub> =1 bar	P <sub>ads</sub> =1 bar P <sub>des</sub> =0.2 bar	
CNS / Coconut shell	73	900	CO <sub>2</sub>	1378	0.54	3.0 - 1.7	1.2 - 0.7	3.3 - 1.9	2.9 - 1.6	[1]
W-AC / Coconut shell	120	800	H <sub>3</sub> PO <sub>4</sub>	-	0.54	-	0.6 - 0.5	-	2.1 - 1.1	[2]
P-AC / Coconut shell	120	600		-	0.68	-	0.7 - 0.0	-	38.5 - 20.6	
PINPEL 20 / Pine wood pellets	300	900	CO <sub>2</sub>	-	-	2.0 - 0.8	1.0 - 0.4	4.4 - 2.5	4.2 - 2.3	[3]
CS / Coconut shell	140	900	CO <sub>2</sub>	809	0.6	2.8 - 1.4	1.1 - 0.5	3.7 - 1.9	4.1 - 2.1	
BC / Babassu coconut				1452	0.32	2.2 - 1.4	0.8 - 0.8	2.9 - 2.4	1.8 - 1.1	[4]
WV1050 / Commercial carbon	-	-	-	1674	0.59	2.6 - 1.0	0.8 - 0.3	4.6 - 2.4	4.6 - 2.4	
CS CO <sub>2</sub> / Cherry stones		885	CO <sub>2</sub>	1045	0.40	2.5 -	1.1 - 0.5	4.0 - 2.2	3.9 - 2.1	[5]
CS H <sub>2</sub> O / Cherry stones		850	H <sub>2</sub> O	998	0.38	2.4 - 1.1	1.1 - 0.6	3.6 - 2.1	3.3 - 1.8	
CK-800 / Corncob	120	800	K <sub>2</sub> CO <sub>3</sub>	1450	0.62	1.0 - 1.8	0.7 - 0.5	1.1 - 0.7	0.7 - 0.4	[6]
CP-500 / Corncob		500	H <sub>3</sub> PO <sub>4</sub>	1069	0.10	6.0 - 3.2	0.3 - 0.8	1.5 - 1.3	1.2 - 0.8	
MSS-AC Extrudes / -	-	-	-	1754	0.07	-	1.8 - 0.5	-	6.7 - 1.3	[7]
Organosorb 10-CO / Nut shells	-	-	-	970	0.36	-	1.3 - 0.7	-	2.9 - 1.9	[8]
1S-1 / Wheat straw	-	700	-	882	0.26	1.8 - 0.3	1.1 - 0.2	10.2 - 7.2	8.9 - 5.6	
1S-2 / Wheat straw	-	750	-	760	0.19	1.9 - 0.6	1.1 - 0.4	6.5 - 5.5	5.0 - 3.5	[9]
2S-2 / Wheat straw	-	800	-	998	0.28	2.8 - 0.6	1.5 - 0.4	8.4 - 5.4	7.4 - 4.1	

2S-3 / Wheat straw	-	800	-	957	0.26	5.0 - 0.7	3.5 - 0.8	13.4 -	8.6 - 7.0	
OTS-1-550 / Oil tea shell	-	-		741	0.25	-	2.8 - 1.1	-	8.5 - 5.4	[10]
			KOH							
OTS-2-650 / Oil tea shell	-	-		1377	0.47	-	4.0 - 1.7	-	4.0 - 2.1	
MCW(PA)3 h / Maize cob waste	180	-	CO <sub>2</sub>	820	0.32	2.2 - 1.3	0.9 - 0.6	3.1 - 1.9	2.7 - 1.5	[11]
PS-2-450 / Palm sheath	-	450		1089	0.42	-	-	-	-	[12]
			NaNH <sub>2</sub>							
PS-1-550 / Palm sheath	-	550		892	0.38	-	2.0 - 0.6	-	6.9 - 3.3	
SA-1-700 / Shrimp shell	-	700	KOH	1405	0.60	-	1.8 - 0.7	-	4.6 - 2.5	[13]
WAPC / Waste wool	-	-	KOH	1352	-	-	1.3 - 0.2	-	10.3 - 8.0	[14]
N-WAPC / Waste wool	-	-	KOH and urea	862	-	-	1.4 - 0.4	-	6.4 - 3.6	
J-AC / Cotton pulp, kenaf, and jute as natural cellulose fibers	-	-		1731	0.34	4.7 - 3.2	1.7 - 1.6	2.8 - 2.0	2.0 - 1.1	[15]
			KOH and HCl							
K-AC / Cotton pulp, kenaf, and jute as natural cellulose fibers	-	-		1978	0.23	4.4 - 3.2	1.5 - 1.6	2.5 - 1.8	1.7 - 1.0	
NAHA 0.5 / -	-	-		747	0.23	4.6 - 0.8	3.0 - 0.6	10.8 - 7.4	9.7 - 4.7	[16]
			Hydro-thermal							
NAHA 4 / -	-	-		1538	0.57	5.6 - 1.0	2.8 - 0.6	10.9 - 6.9	9.6 - 4.3	
CBF-1273-CO2-1h / Banana peels	60	127 3	Zinc - CO <sub>2</sub>	1426	0.56	3.0 - 0.9	6.0 - 3.0	1.4 - 0.4	6.5 - 3.3	[17]
PP-A850C1 / Pomegranate fruit		850	K <sub>2</sub> CO <sub>3</sub>	1542	0.23	10.2 - 3.8	5.5 - 2.9	5.0 - 5.4	3.5 - 2.0	[18]

A<sub>BET</sub>: BET area

V<sub>mic</sub>: microporous volume as obtained by application of the BET method to N<sub>2</sub> adsorption isotherms

**Table S2.** Carbon molecular sieves (CMSs), metal organic frameworks (MOFs) and zeolites for CO<sub>2</sub>/CH<sub>4</sub> separation in PSA units evaluated at T ≈ 25°C.

Adsorbent	Sample	Amount adsorbed (mol·kg <sup>-1</sup> ) for: CO <sub>2</sub> =35%, CH <sub>4</sub> =65%		PSA performance parameters for: CO <sub>2</sub> =35%, CH <sub>4</sub> =65%		Ref.
		CO <sub>2</sub> - CH <sub>4</sub>		CO <sub>2</sub> /CH <sub>4</sub> Selectivity – PSA Working capacity (mol·kg <sup>-1</sup> )		
		P=5 bar	P=1 bar	P <sub>ads</sub> =5 bar P <sub>des</sub> =1 bar	P <sub>ads</sub> =1 bar P <sub>des</sub> =0.2 bar	
CMS	PKS-carbon-800	-	0.9 - 0.5	-	3.4 - 1.7	[19]
	CMS 3K	1.6 - 0.7	0.8 - 0.3	6.4 - 4.1	5.6 - 2.9	[20]
	CMS KP 407	1.9 - 0.6	1.1 - 0.4	5.9 - 3.4	5.5 - 2.9	[21]
	CMS-FB	1.6 - 0.5	0.8 - 0.3	6.4 - 4.1	5.6 - 2.9	[22]
MOF	Cu-BTC	6.2 - 1.0	2.0 - 0.5	11.8 - 9.0	7.3 - 4.8	[23]
	MOF-5	-	0.3 - 0.1	-	11.6 - 10.5	[24]
	Cu-MOF extrudates	5.5 - 0.9	2.1 - 0.4	10.9 - 5.8	11.1 - 5.9	[25]
	ZIF-L	-	0.6 - 0.0	-	37.7 - 22.4	[26]
	ZrMOF NH <sub>4</sub>	2.7 - 0.8	1.0 - 0.3	6.2 - 3.3	6.3 - 3.3	[27]
Zeolite	Zeolite NaX	-	3.2 - 0.1	-	75.9 - 147.2	
	Zeolite CaX	-	2.3 - 0.1	-	45.5 - 109.0	
	Zeolite NaA	-	1.7 - 0.1	-	37.3 - 14.7	[28]
	Zeolite CaA	-	2.3 - 0.0	-	145.8 -	
	Zeolite ZSM-5	-	0.7 - 0.4	-	3.6 - 2.0	
	Zeolite Y	-	0.5 - 0.3	-	3.4 - 1.7	
	Zeolite APGi	-	3.2 - 0.1	-	80.0 - 25.8	[29]
	Zeolite NaUSY	-	2.6 - 0.1	-	50.3 - 30.6	
Z10-04	4.9 - 0.3	3.9 - 0.1	35.5 - 6.0	81.5 - 21.7	[30]	

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