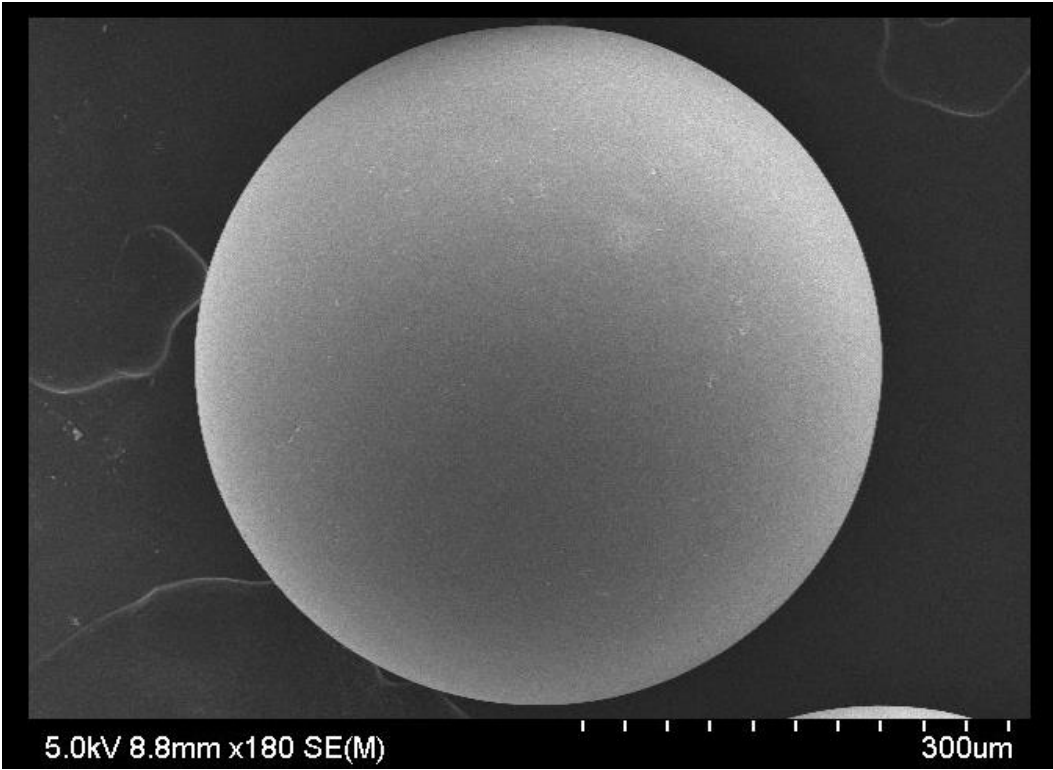
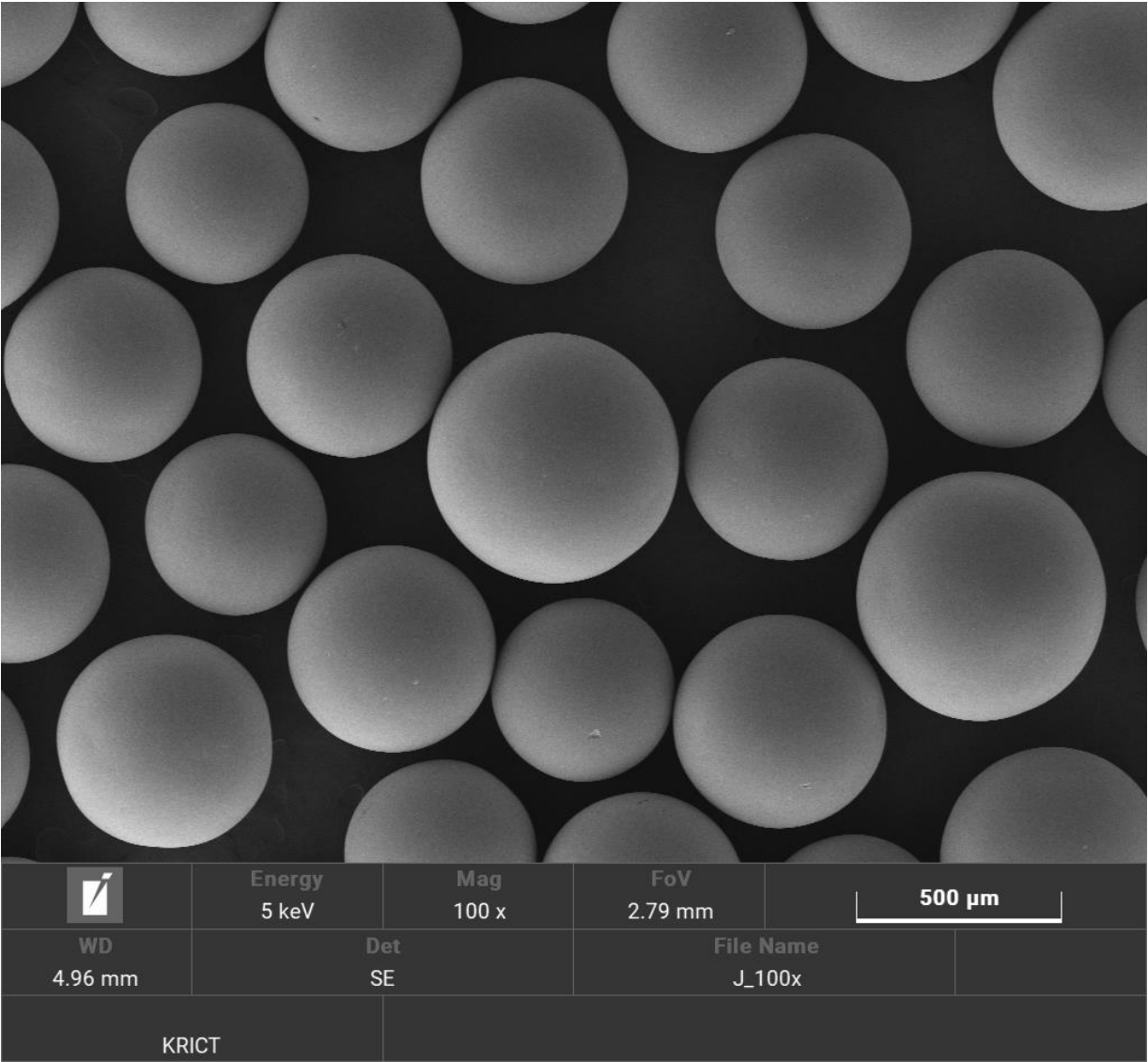
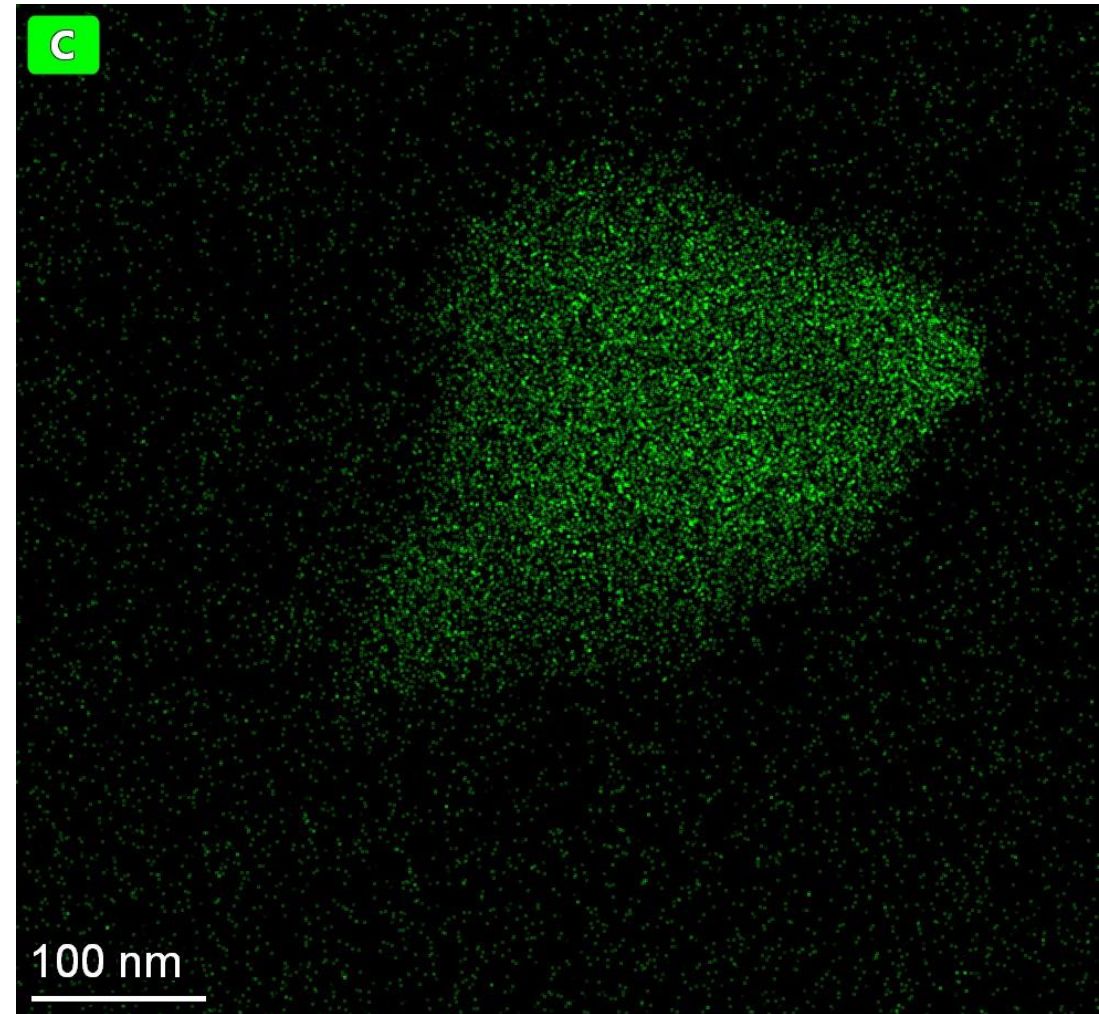
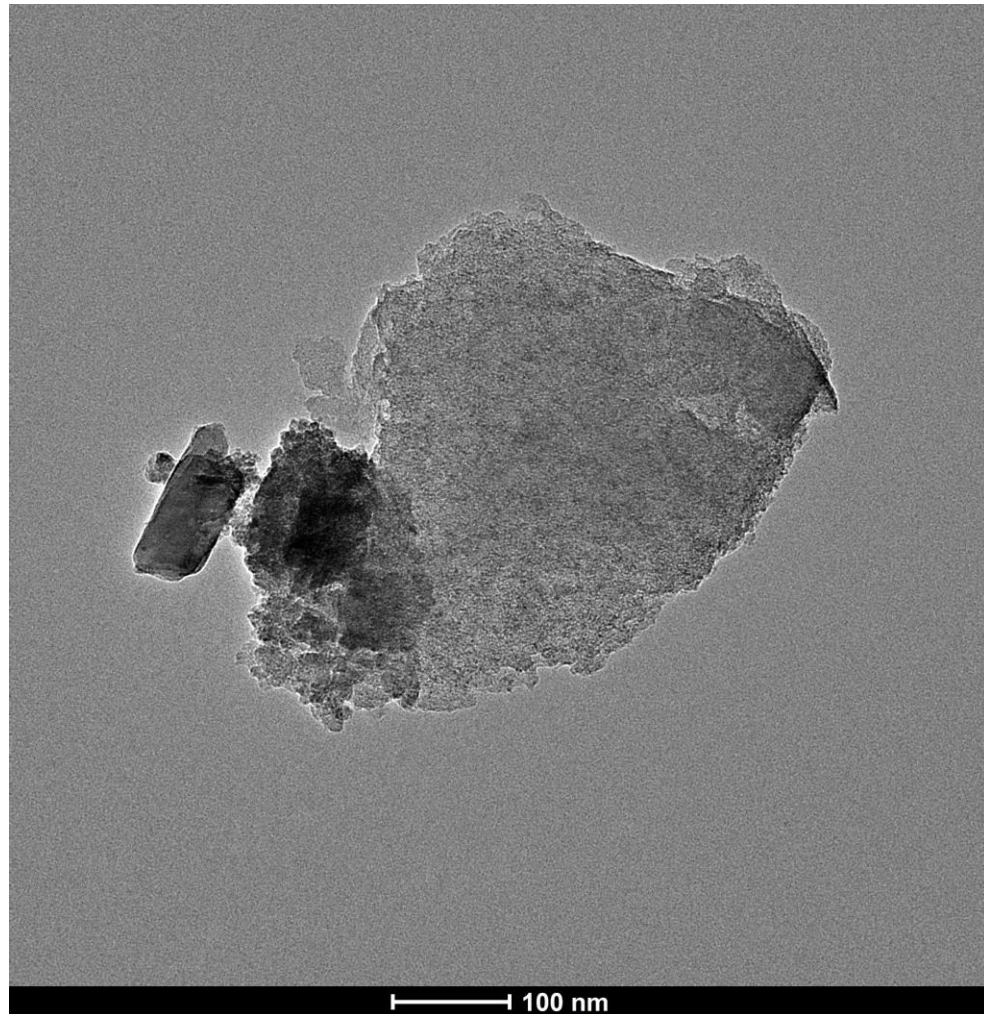


Supplementary Information

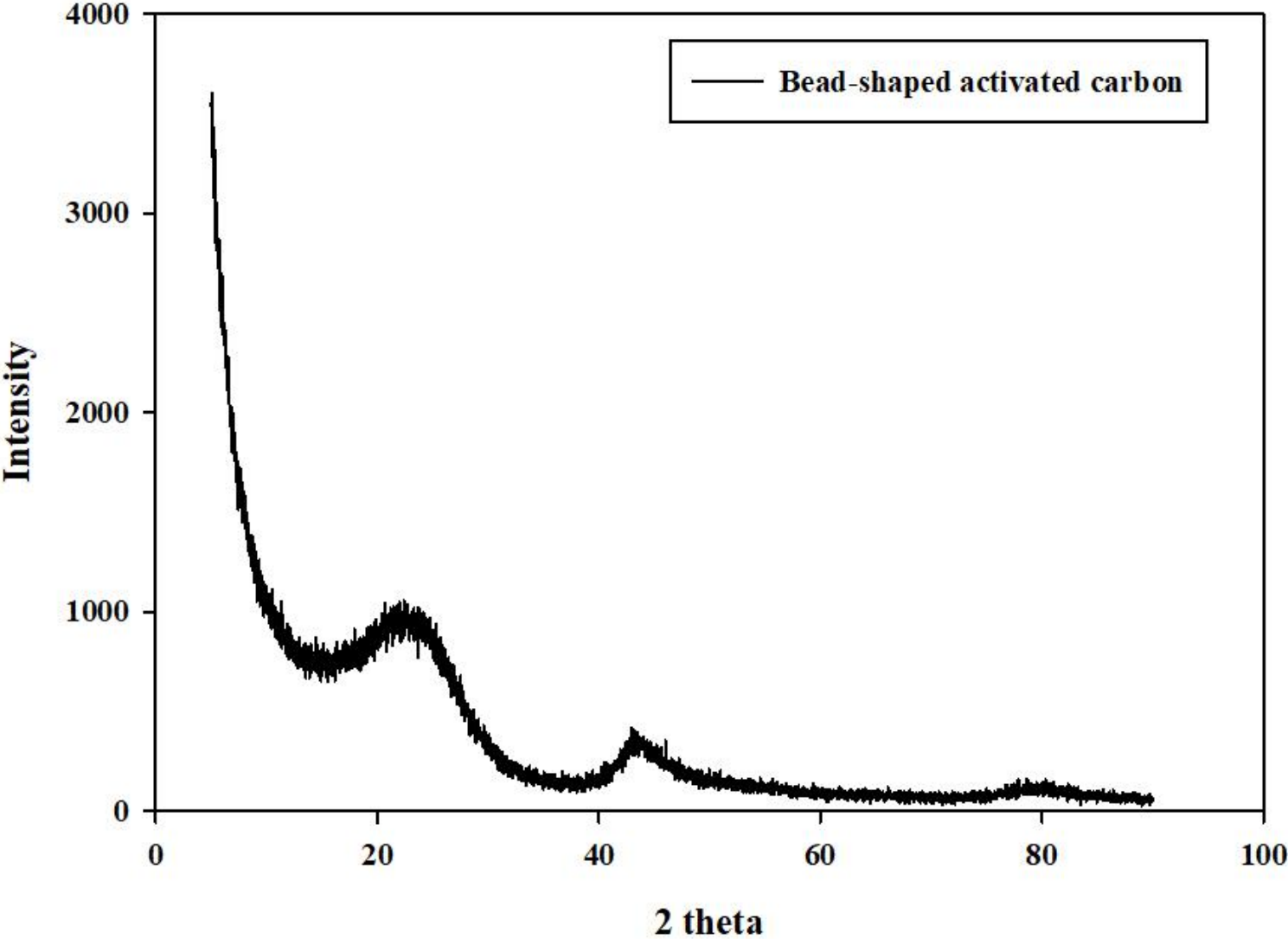
Supplementary Information-1: SEM Morphology of Bare BAC



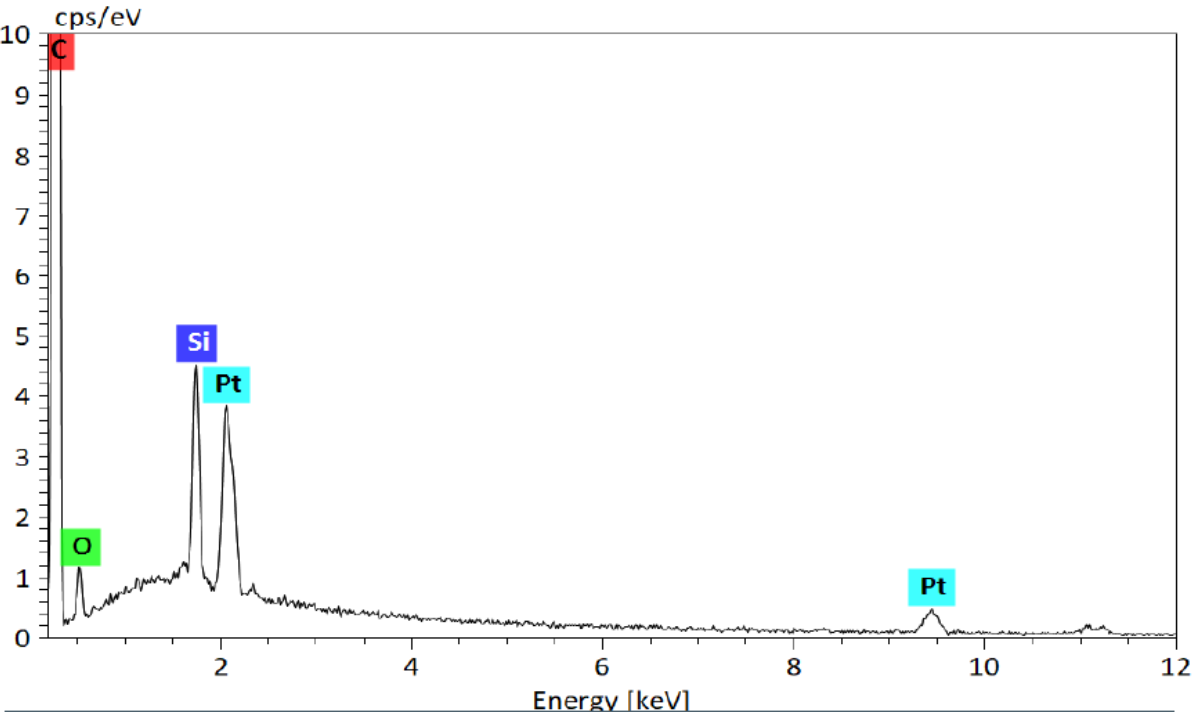
Supplementary Information-2: TEM Morphology of Bare BAC (After Grinding/Crushing BAC)



Supplementary Information-3: XRD Patterns of Bare BAC



Supplementary Information-4: SEM-EDX of Bare BAC



Element	Mass (%)	Atom (%)
C	94.41	96.10
O	4.45	3.40
Si	1.14	0.50
Pt	0.00	0.00
	100.00	10.00

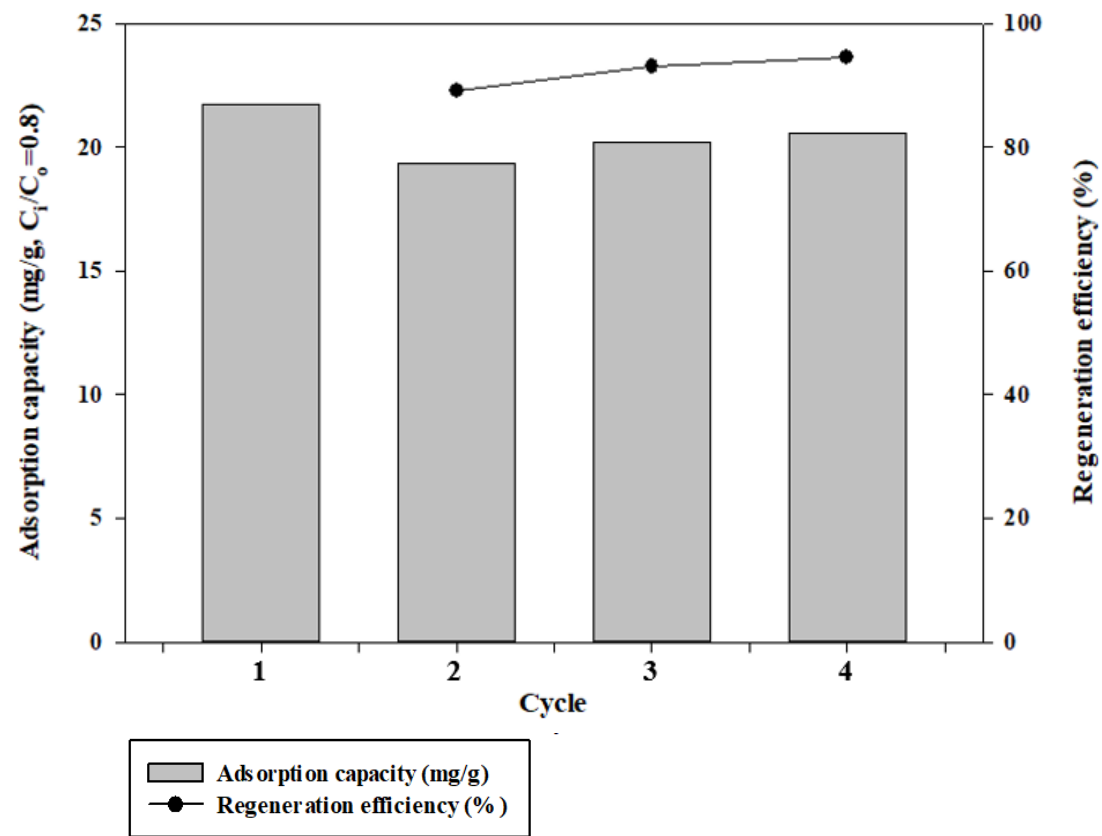
Pt: Coating material during the measurement

Supplementary Information-5: Attrition and Abrasion Test of Bare BAC (Physical Stability)

sample \ [%]	1 st -time	2 nd -time	Mean Value±Deviations
BAC	99.65	99.88	99.77±0.11

- Method : ASTM D4058–96 & SPENCE method, Attrition and abrasion testers
- Conditions
 - Wight of test BAC : 100g
 - Duration of the test : 30min
 - Rotating speed : 54rpm
 - Sieve : 250um

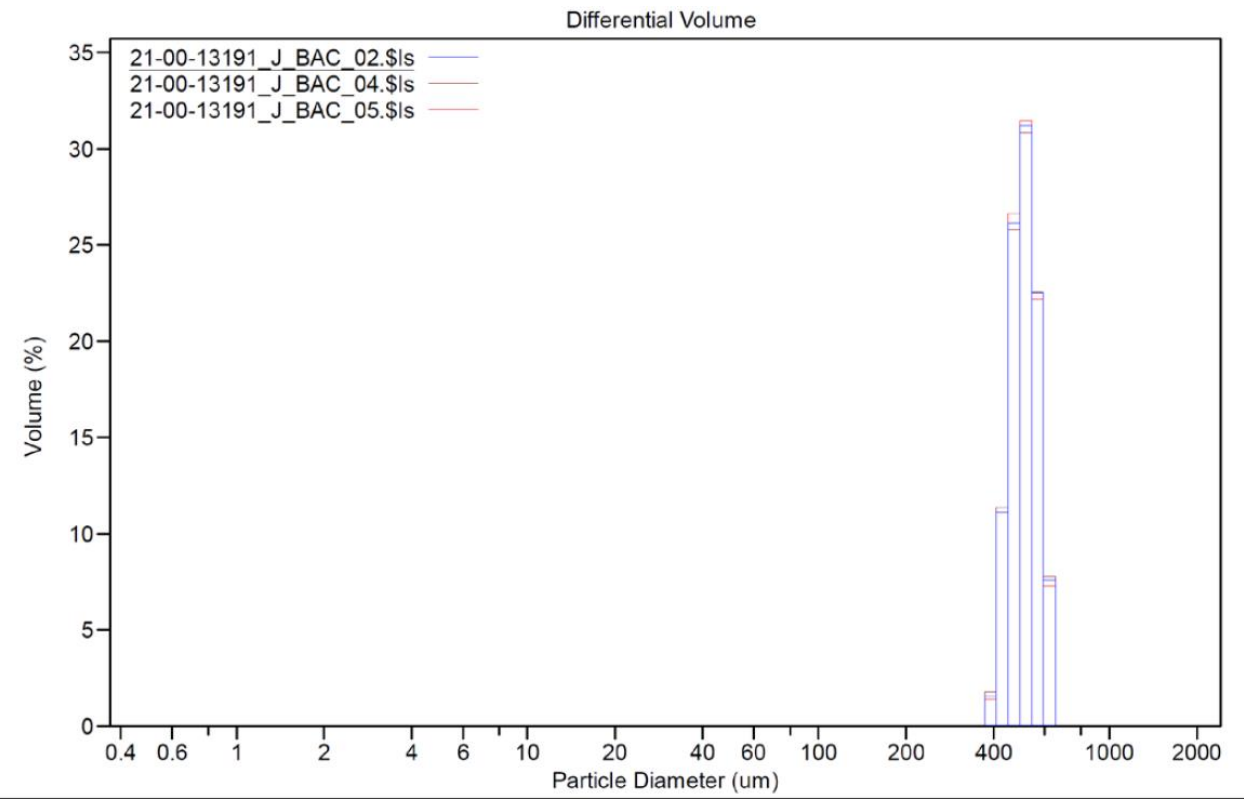
Supplementary Information-6: Acetaldehyde Cycle Test over Bare BAC



Cycle	Adsorption capacity (mg/g, $C_i/C_o=0.8$)	Regeneration efficiency (%)
1 (Fresh)	21.73	-
2	19.36	89.09
3	20.21	93.01
4	20.55	94.57

Acetaldehyde 200 ppm, GHSV 37,500 hr⁻¹, 25°C, 1.255 L/min, adsorbent 2 ml

Supplementary Information-7: Particle Size Distribution of Bare BAC



Run	Particle size (μm)			
	Diameter at 10%	Diameter at 50%	Diameter at 90%	Average
1	440.2	511.0	589.2	512.9
2	438.7	511.0	589.6	512.7
3	440.6	510.3	588.3	512.3
SD	1.00	0.40	0.67	0.31
CV (%)	0.23	0.08	0.11	0.006
Average	439.8	510.8	589.0	512.6

Supplementary Information-8: CH₃CHO adsorption parameters on coconut shell and coal based activated carbon samples

Sample	C _{in}	W _{ad}
	[ppm]	[mg/g]
Coconut shell activated carbon	200	20.87
Coconut-P7N1-900	200	53.46
Coal based activated carbon	200	16.81
Coal-P7N1-900	200	23.43