

## *Supporting Information*

# Carbon Black Structural Effect within Kraft Black Liquors-based Poly(HIPE): Enhanced Hydrogen Storage and Electro-Capacitive Properties

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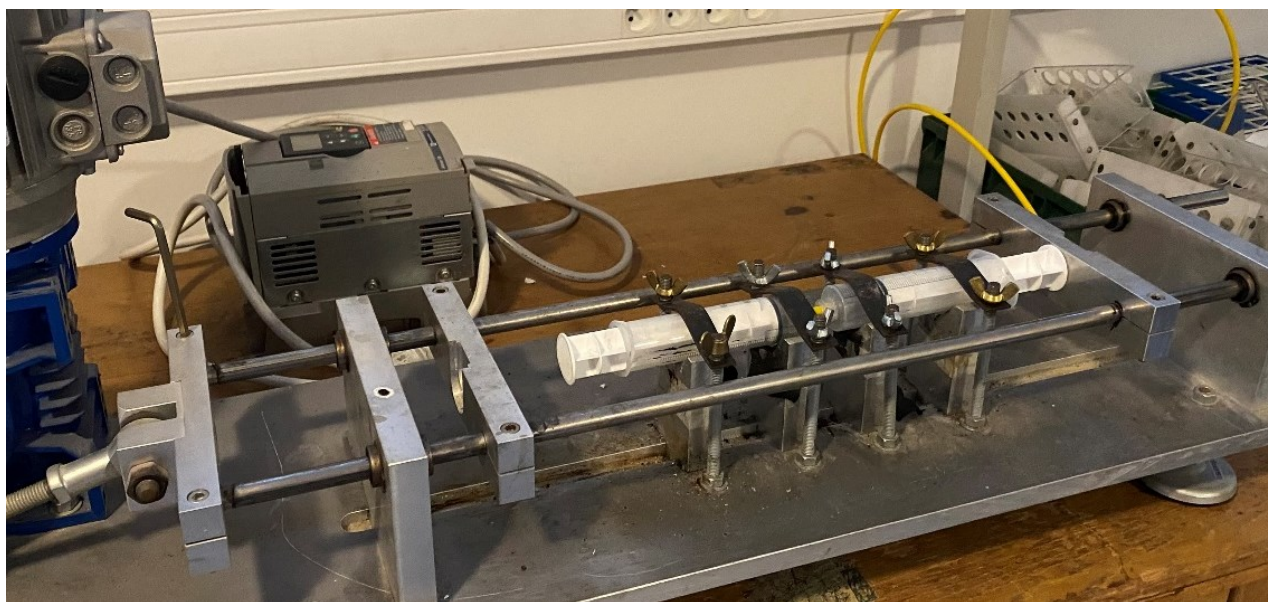
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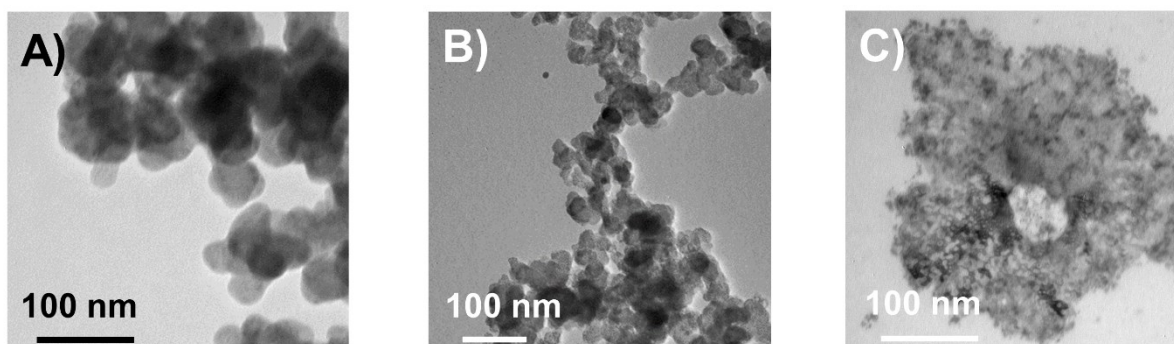
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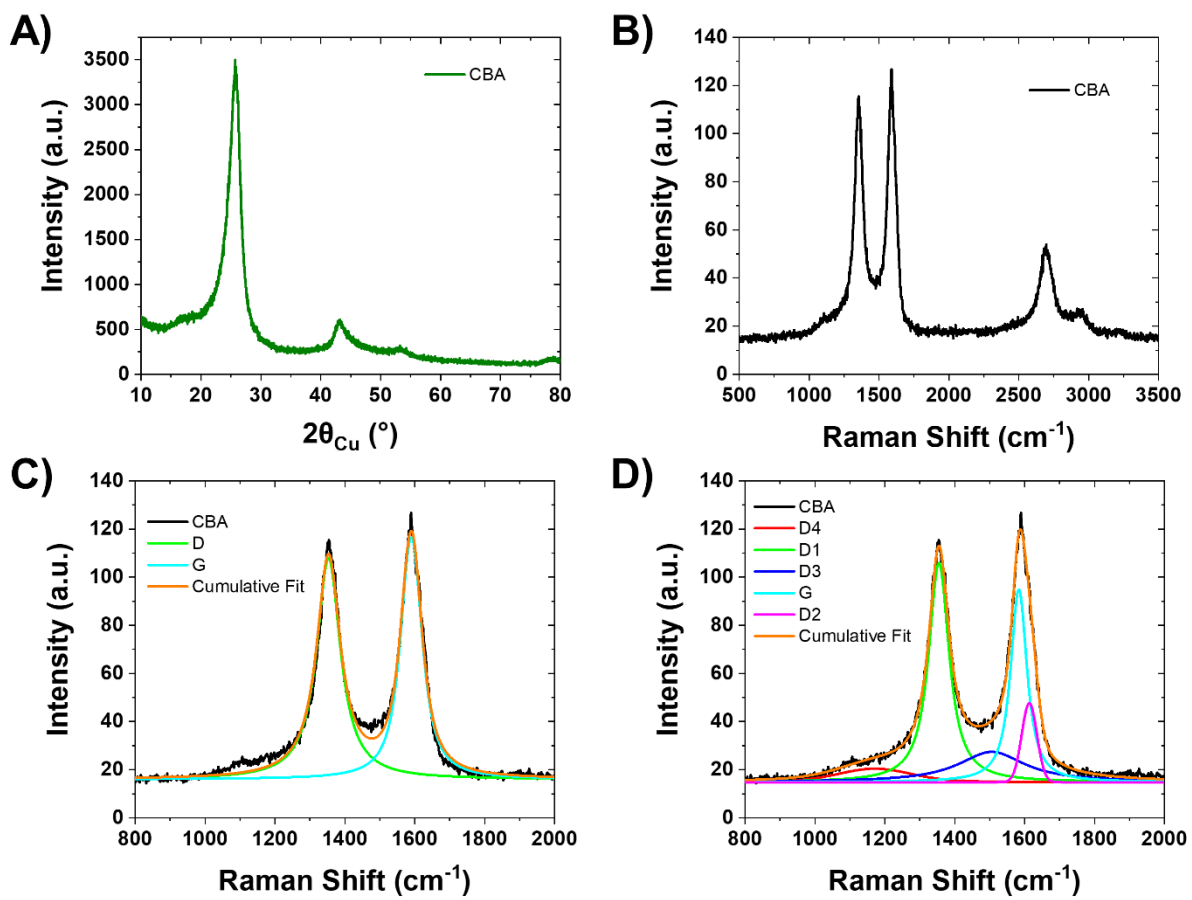
**Figure S1:** Photography of the home made double syringe pump used for emulsification. For size comparison, each syringe is about 14.5 cm length.

**Table S1:** Physical-Chemistry characteristics of the three carbon blacks in use

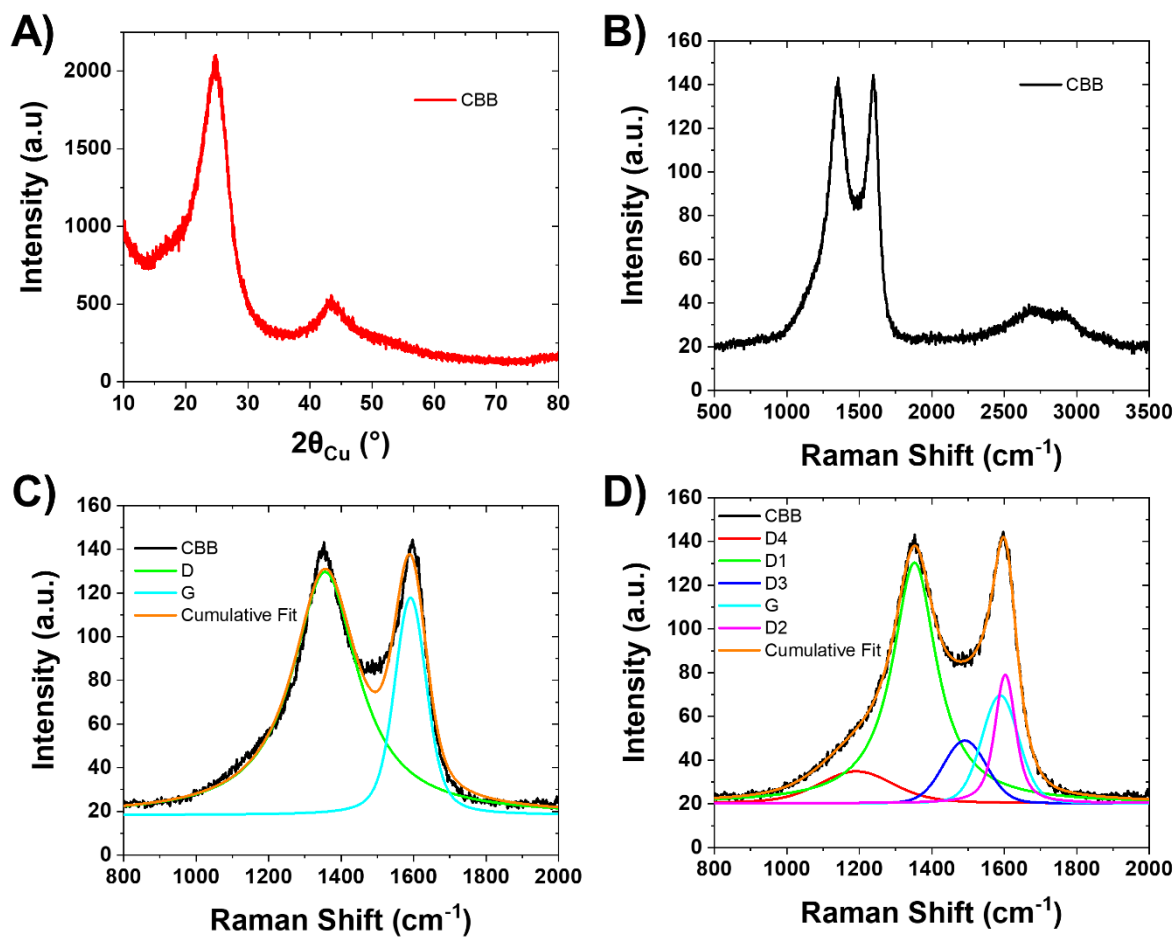
Nomenclature	CB commercial reference	$\zeta$ Potential (mV)	Specific area ( $\text{m}^2\cdot\text{g}^{-1}$ )
CBA	PBX55	-34.9	75
CBB	Vulcan XC 72	-9.6	250
CBC	PBX51	-21.7	1500



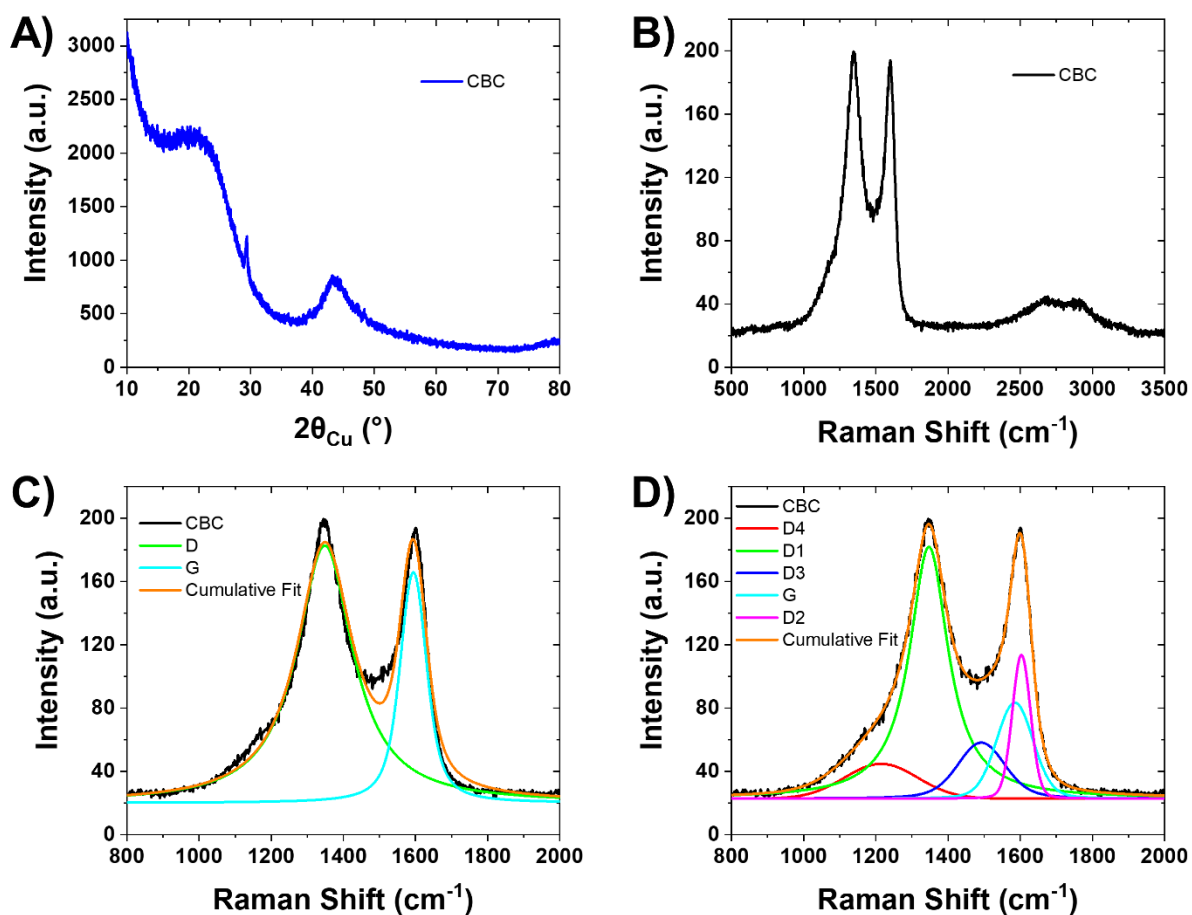
**Figure S2:** Transmission electron micrographs of the three different carbon black types used, with A) CBA; B) CBB and C) CBC. The CBA, CBB and CBC carbon black powers are exhibiting specific surface areas of 75; 250 and 1500  $\text{m}^2\cdot\text{g}^{-1}$ , respectively.



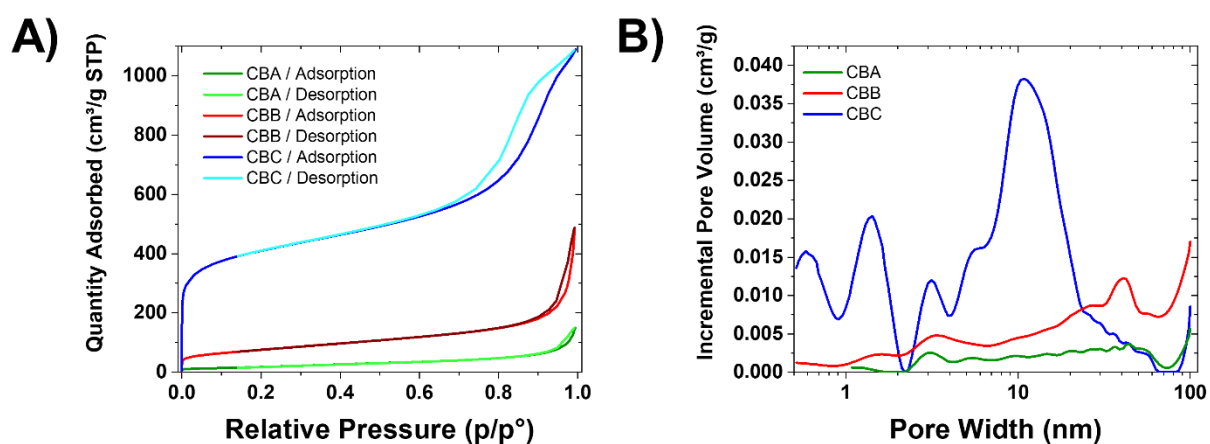
**Figure S3:** A) XRD diffractogram; B) Raman spectra with C) a 2-peaks fitting and D) a 5-peaks fitting of CBA.



**Figure S4:** A) XRD diffractogram; B) Raman spectra with C) a 2-peaks fitting and D) a 5-peaks fitting of CBB.



**Figure S5:** A) XRD diffractogram; B) Raman spectra with C) a 2-peaks fitting and D) a 5-peaks fitting of CBC.



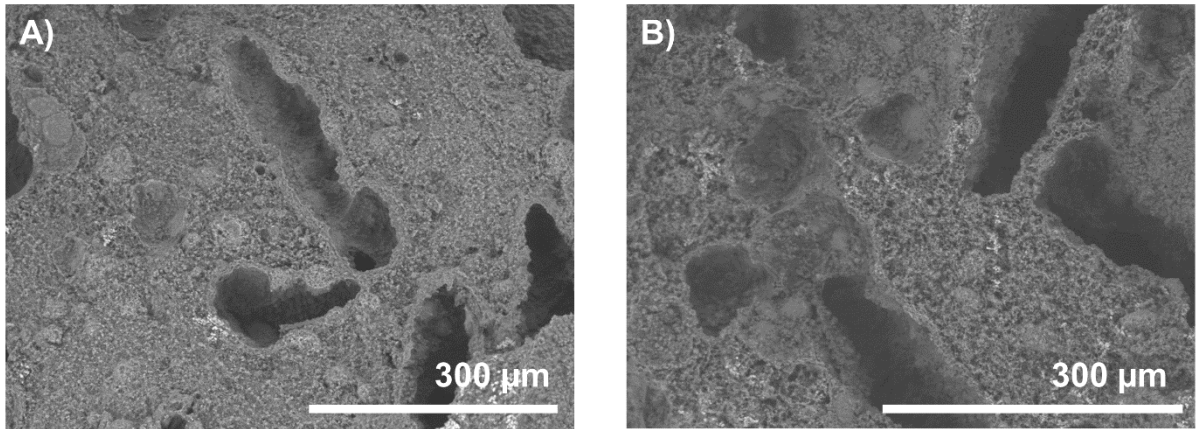
**Figure S6:** A) Nitrogen adsorption curves for the different pure carbon blacks as well as B) porosity obtained from NLDFT treatment of the nitrogen adsorption curves (NLDFT model from the Micromeritics software)

**Table S2:** Main data extracted from the mercury intrusion porosimetry of all the samples elaborated in this study. Namely porosity as well as skeletal and bulk densities.

	CBA – 0.5%	CBA – 1%	CBA – 3%	CBA – 5%
Porosity (%)	55	56	59	52
Skeletal density (g.mL <sup>-1</sup> )	1.46	1.48	1.39	1.35
Bulk density (g.mL <sup>-1</sup> )	0.66	0.65	0.57	0.65
	CBB – 0.5%	CBB – 1%	CBB – 3%	CBB – 5%
Porosity (%)	56	61	64	63
Skeletal density (g.mL <sup>-1</sup> )	1.36	1.40	1.40	1.32
Bulk density (g.mL <sup>-1</sup> )	0.60	0.54	0.51	0.49
	CBC – 0.5%	CBC – 1%	CBC – 3%	CBC – 5%
Porosity (%)	52	60	60	61
Skeletal density (g.mL <sup>-1</sup> )	1.40	1.36	1.29	1.44
Bulk density (g.mL <sup>-1</sup> )	0.67	0.55	0.52	0.56

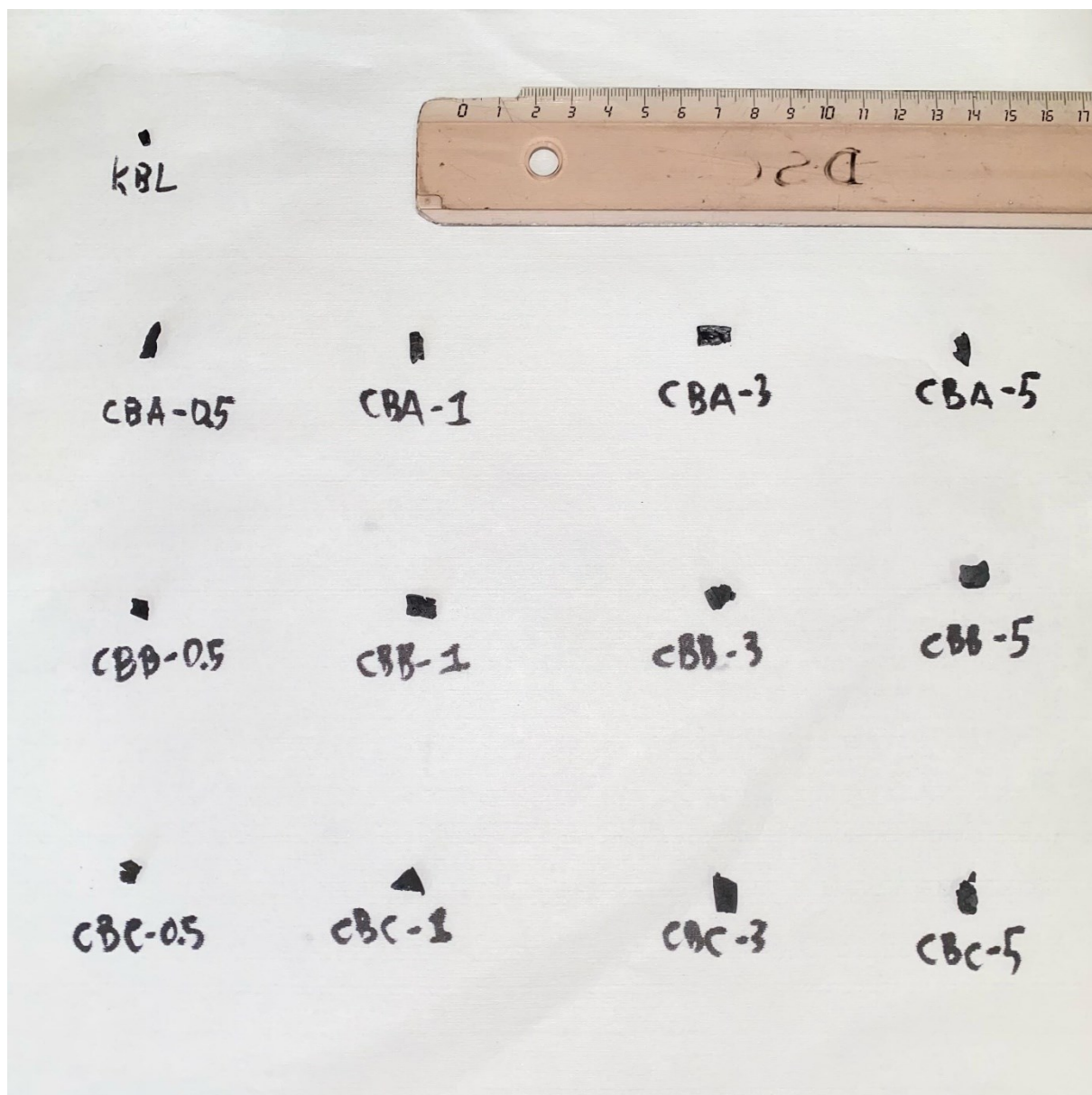


**Figure S7:** Photography of obtained monolith blocks of the different synthesized samples synthesized. The blocks presented here are cut from their respective samples after the drying step. Ruler in centimetre for scale.



**Figure S8:** SEM pictures of A) CBC-1 and B) CBB-5 depicting emulsion dephasing steps.





**Figure S9:** Photography of obtained carboHIPE blocks of the different synthesized samples. The samples presented here are obtained after carbonization step. Ruler in centimetre for scale.

**Table S3:** R1 and R2 parameters obtained through the 2-parameters fitting of the Raman spectra of each samples

Parameter	KBLc	Pure CBA	CBA – 0.5%	CBA – 1%	CBA – 3%	CBA – 5%
R1	4.19	1.12	3.37	2.90	3.81	3.77
R2	0.81	0.53	0.76	0.74	0.79	0.78

Parameter	KBLc	Pure CBB	CBB – 0.5%	CBB – 1%	CBB – 3%	CBB – 5%
R1	4.19	3.15	2.46	3.58	3.55	4.07
R2	0.81	0.77	0.70	0.77	0.77	0.80

Parameter	KBLc	Pure CBC	CBC – 0.5%	CBC – 1%	CBC – 3%	CBC – 5%
R1	4.19	2.83	2.63	2.90	3.53	4.04
R2	0.81	0.74	0.72	0.73	0.78	0.80

**Table S4:**  $I_{Dx}/I_G$  and  $I_G/I_{all}$  ratios as given by the 5-peaks fitting of the different Raman spectra

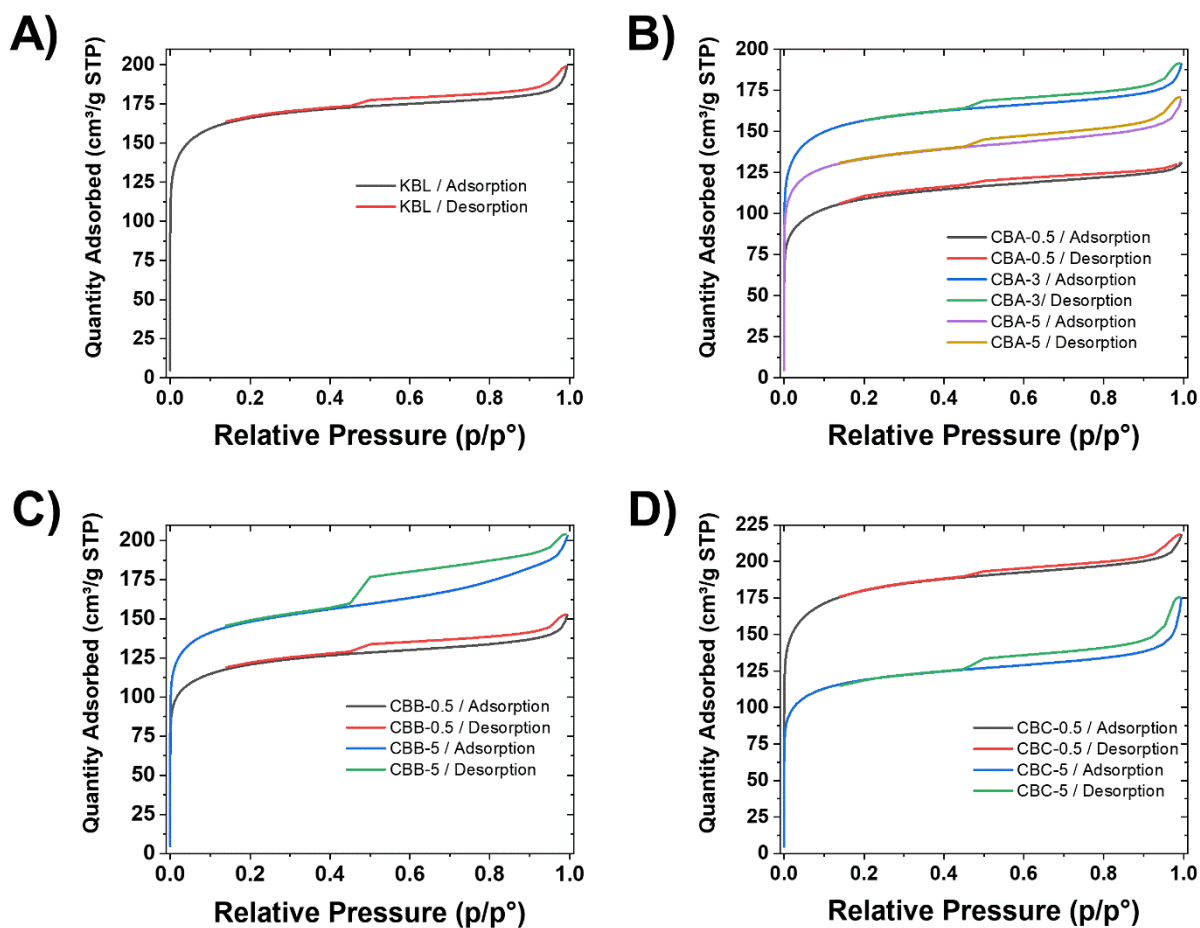
Parameter	KBLc	Pure CBA	CBA – 0.5%	CBA – 1%	CBA – 3%	CBA – 5%
$I_{D1}/I_G$	4.14	1.39	2.60	2.86	3.29	3.62
$I_{D2}/I_G$	0.67	0.29	0.62	0.52	0.69	0.53
$I_{D3}/I_G$	0.65	0.67	0.35	0.33	0.40	0.51
$I_{D4}/I_G$	0.54	0.34	0.48	0.40	0.61	0.59
$I_G/I_{all}$	0.14	0.27	0.21	0.21	0.17	0.17

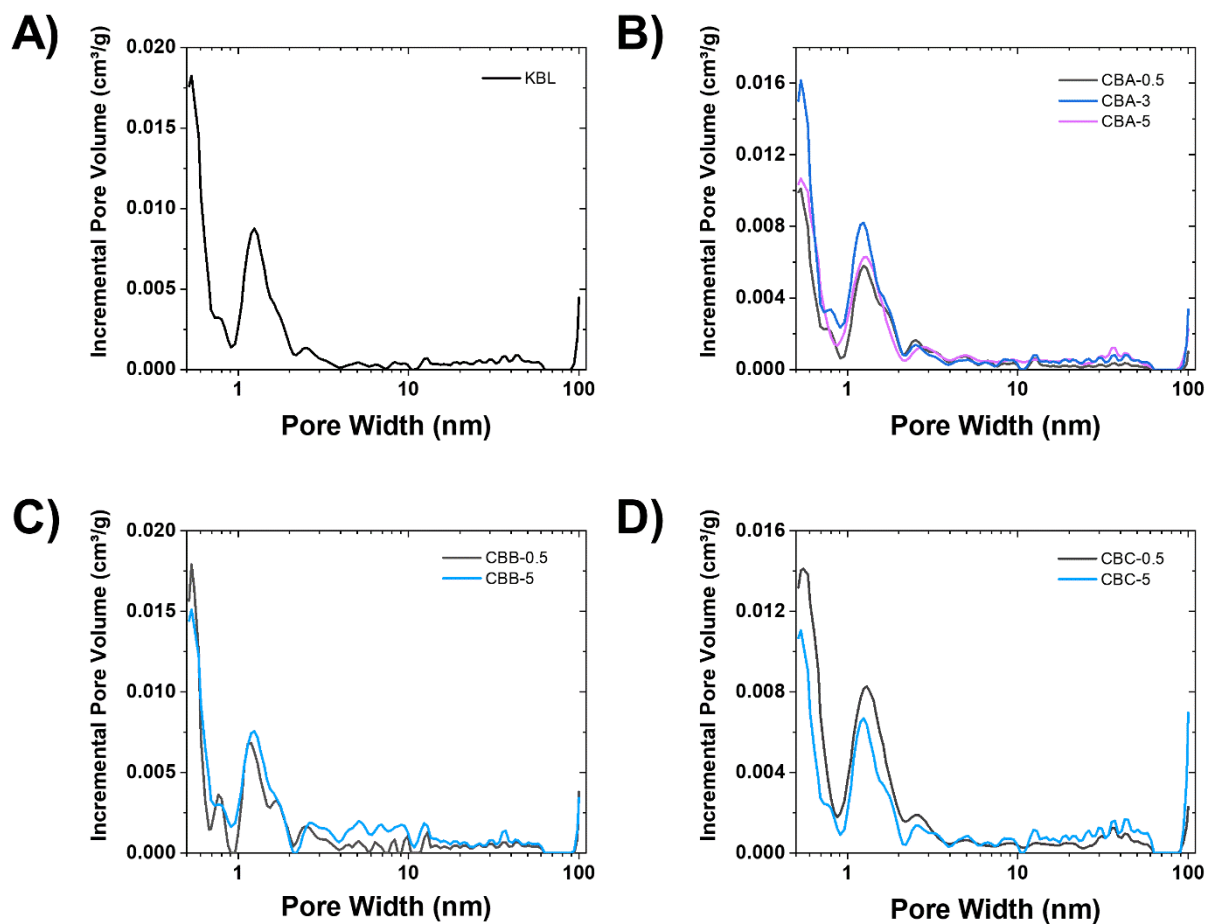
Parameter	KBLc	Pure CBB	CBB – 0.5%	CBB – 1%	CBB – 3%	CBB – 5%
$I_{D1}/I_G$	4.14	3.59	2.97	2.92	3.57	3.79
$I_{D2}/I_G$	0.67	0.77	0.56	0.50	0.60	0.62
$I_{D3}/I_G$	0.65	0.54	0.37	0.39	0.55	0.46
$I_{D4}/I_G$	0.54	0.61	0.33	0.58	0.77	0.46
$I_G/I_{all}$	0.14	0.15	0.20	0.20	0.16	0.16

Parameter	KBLc	Pure CBC	CBC – 0.5%	CBC – 1%	CBC – 3%	CBC – 5%
$I_{D1}/I_G$	4.14	3.59	2.25	2.82	3.50	3.84
$I_{D2}/I_G$	0.67	0.71	0.74	0.71	0.68	0.66
$I_{D3}/I_G$	0.65	0.68	0.38	1.04	0.32	0.75
$I_{D4}/I_G$	0.54	0.76	0.70	0.72	0.42	0.59
$I_G/I_{all}$	0.14	0.15	0.20	0.16	0.17	0.15



**Figure S10:** Nitrogen Adsorption curves for A) the KBLc monolith sample, B) the CBA-loaded samples, C) CBB-loaded samples and D) CBC-loaded samples.



**Figure S11:** Porosimetry curves obtained from the NLDFT treatment of the nitrogen adsorption curves for A) the KBLc monolith sample, B) the CBA-loaded samples, C) CBB-loaded samples and D) CBC-loaded samples. NLDFT model from the Micromeritics software.