Electronic Supplementary Material (ESI) for Journal of Materials Chemistry A.

Electronic Supporting Information

Nitrogen-doped Carbons Prepared from Eutectic Mixtures as Metal-Free Oxygen Reduction Catalysts

by

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Figure S1 – Left panel: ^{1}H RMN spectra of (a) R2CPC-DES and (b) R4CPC-DES. **Right panel:** Picture of (top) R2CPC-DES and (bottom) R4CPC-DES.

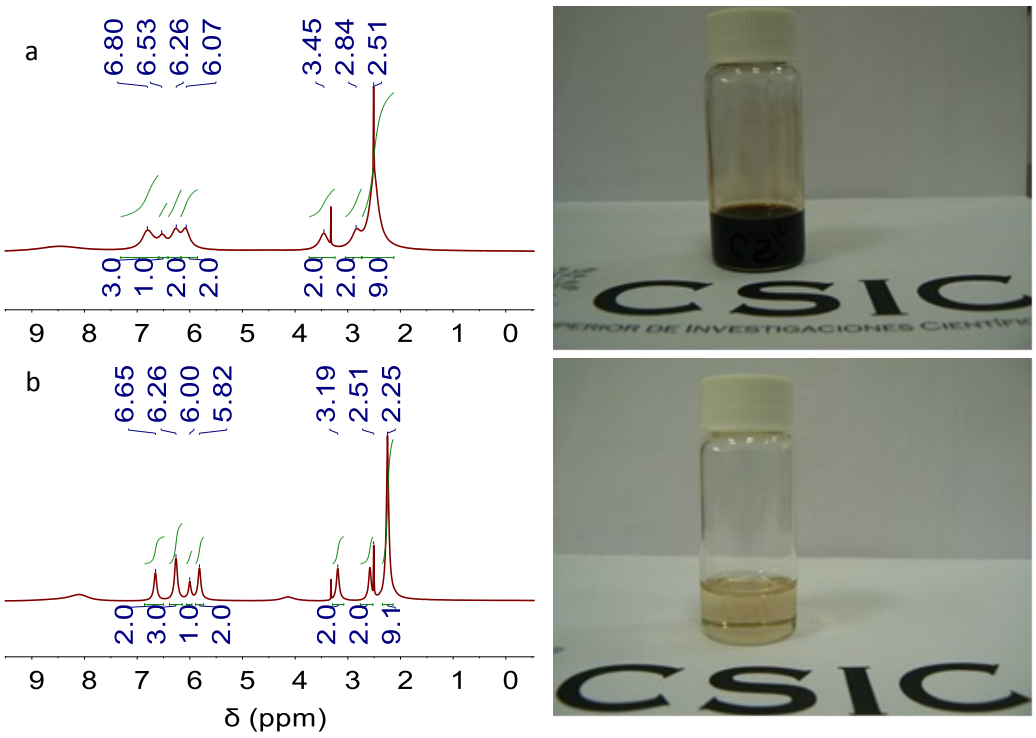

Figure S2 – ^{1}H NMR spectra of the aqueous dilutions - ca. 53 wt% - of (a) R2CPC-DES and (b) R4CPC-DES.

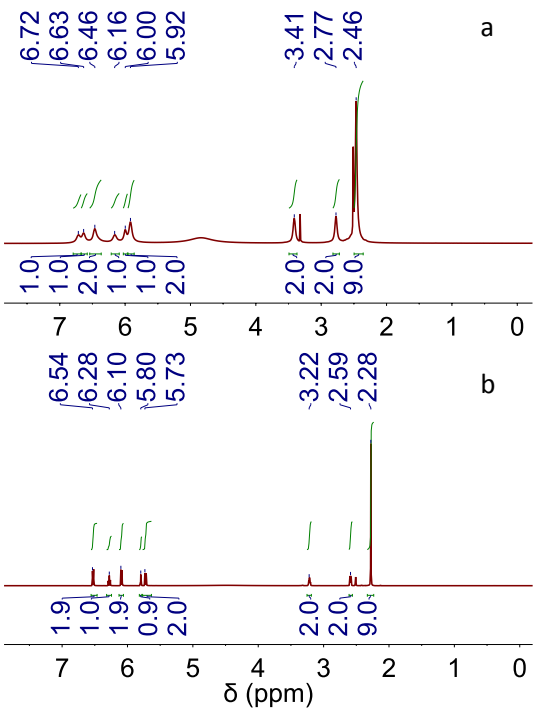

Figure S3 – Picture of resins (after freeze-drying) and carbon monoliths. From left to right: R2CPC carbon, R2CPC resin, R4CPC carbon, and R4CPC resin.

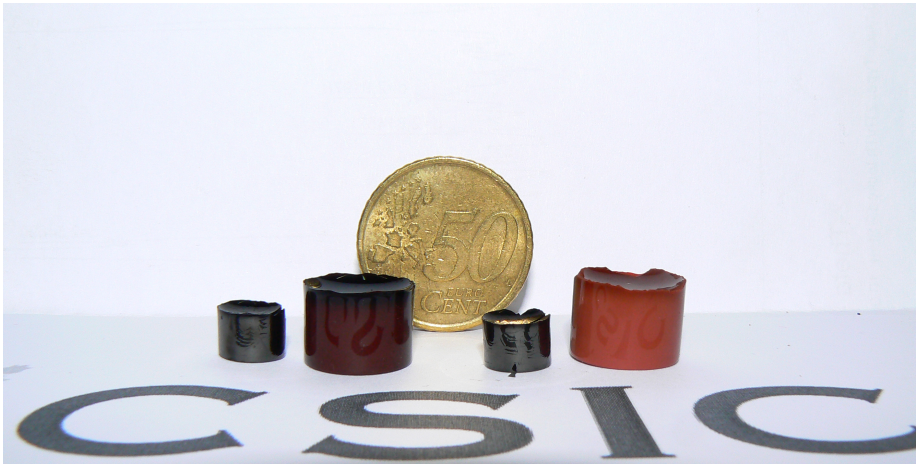

Figure S4 – Study of freeze-dried extracts obtained after washing R2CPC and R4CPC resins with abundant water. **Right panel:** Pictures of the extracts coming from (top) R2CPC and (bottom) R4CPC resins. **Left panel:** ^{1}H NMR spectra of f the extracts coming from (a) R2CPC and (b) R4CPC resins.

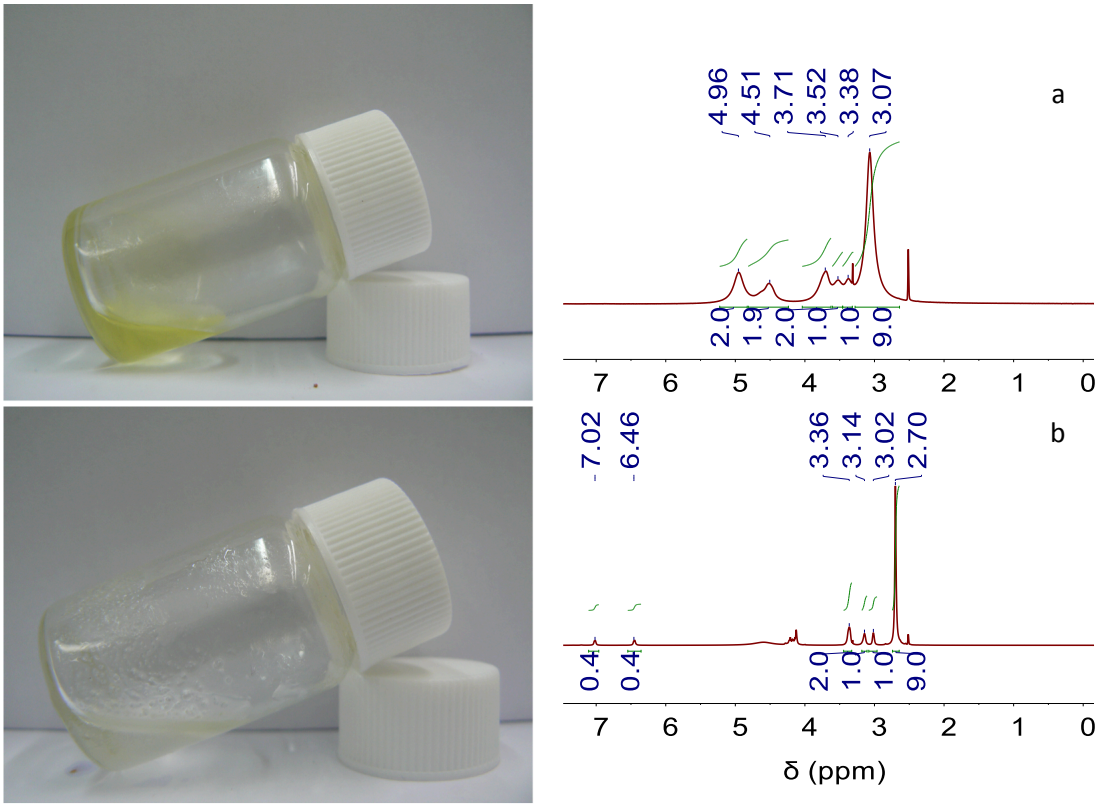

Table S1 – ^{1}H RMN chemical shifts of R2CPC-DES, the diluted R2CPC-DES (R2CPC-DES-d) and the freeze-dried extract coming from R2CPC resin (R2CPC-E) using DMSO as external reference. The chemical shifts of resorcinol (R), choline chloride (C) and 2-cyanophenol (2CP) in DMSO are given as a reference.

	δ(ppm)									
	Resorcinol			Choline chloride			2-Cyanophenol			
	CH at C2	CH at C4&C6	CH at C5	CH_2 at C2	CH_2 at C1	$3xCH_3$ at N	CH at C3	CH at C4	CH at C5	CH at C6
R	6.30 (1H)	7.05 (2H)	6.51 (1H)	-	-	-	-	-	-	-
C	-	-	-	3.97 (2H)	3.43 (2H)	3.30 (9H)	-	-	-	-
2CP	-	-	-	-	-	-	7.50 (1H)	6.95 (1H)	7.45 (1H)	7.06 (1H)
R2CPC-DES	6.80 (1H)*	6.07 (2H)	6.26 (1H)	3.45 (2H)	2.84 (2H)	2.51 (9H)	6.26 (1H)	6.80 (1H)*	6.53 (1H)	6.80 (1H)*
R2CPC-DES-d	6.72 (1H)	6.46 (2H)	6.63 (1H)	3.41 (2H)	2.77 (2H)	2.46 (9H)	6.72 (1H)	6.46 (1H)*	6.63 (1H)	6.46 (1H)*
R2CPC-E	-	-	-	3.71 (2H)	3.52+3.38 (1H+1H)	3.07 (9H)	4.51 (0.5H)	4.51 (0.5H)	4.51 (0.5H)	4.51 (0.5H)

Table S2 – ^{1}H RMN chemical shifts of R4CPC-DES, the diluted R4CPC-DES (R4CPC-DES-d) and the freeze-dried extract coming from R4CPC resin (R4CPC-E) using DMSO as external reference. The chemical shifts of resorcinol (R), choline chloride (C) and 4-cyanophenol (4CP) in DMSO are given as a reference.

	δ(ppm)							
	Resorcinol			Choline chloride			4-Cyanophenol	
	CH at C2	CH at C4&C6	CH at C5	CH_2 at C2	CH_2 at C1	$3xCH_3$ at N	CH at C3&C5	CH at C2&C6
R	6.31 (1H)	7.05 (2H)	6.51 (1H)	-	-	-	-	-
C	-	-	-	3.97 (2H)	3.43 (2H)	3.30 (9H)	-	-
4CP	-	-	-	-	-	-	7.65 (2H)	6.93 (2H)
R4CPC-DES	6.00 (1H)	5.82 (2H)	6.26 (1H)*	3.19 (2H)	2.51 (2H)	2.25 (9H)	6.65 (2H)	6.26 (2H)*
R4CPC-DES-d	5.80 (1H)	5.73 (2H)	6.28 (1H)	3.22 (2H)	2.59 (2H)	2.28 (2H)	6.54 (2H)	6.10 (2H)
R4CPC-E	-	-	-	3.36 (2H)	3.14+3.02 (1H+1H)	2.70 (9H)	7.02 (0.4H)	6.46 (0.4H)

Figure S5 – (a) Pore size distribution obtained from 2D-NLDFT-HS and (b) BJH.

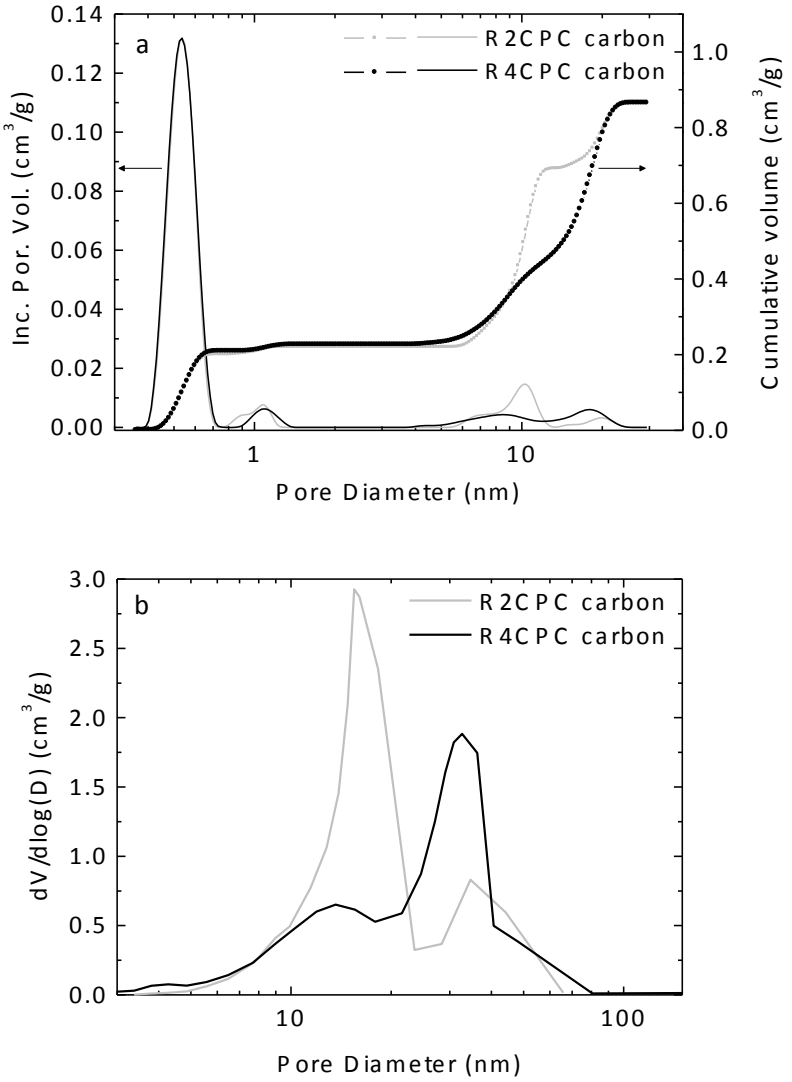

Figure S6 – (a) CV of Pt/C 20% in N_2 saturated 0.1 M KOH (black line), in O_2 saturated 0.1 M KOH (orange line) and in 0.3M MeOH O_2 saturated 0.1 M KOH (green line). (b) LSV curves of Pt/C 20% in O_2 saturated 0.1M KOH recorded at different rotation speeds.

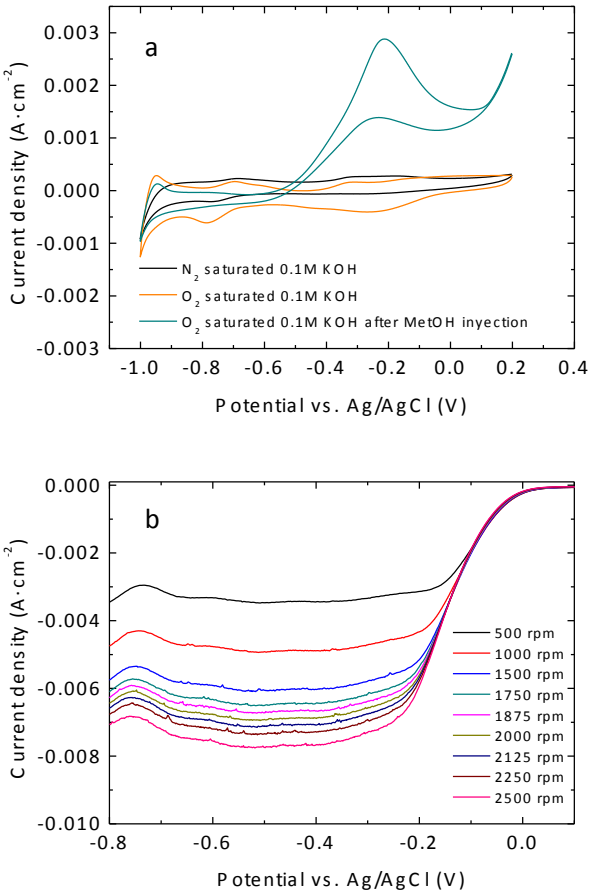

Figure S7 – CV recorded after stability test (blue line) and at 1600 rpm of R4CPC carbon in N_2 saturated 0.1 M KOH (black line), in O_2 saturated 0.1 M KOH (red line) and in O_2 saturated 0.1 M KOH.