

Supplemental Material

Ionic liquids to monitor the nano-structuration and the surface functionalization of material electrodes: a proof of concept applied to cobalt oxyhydroxide

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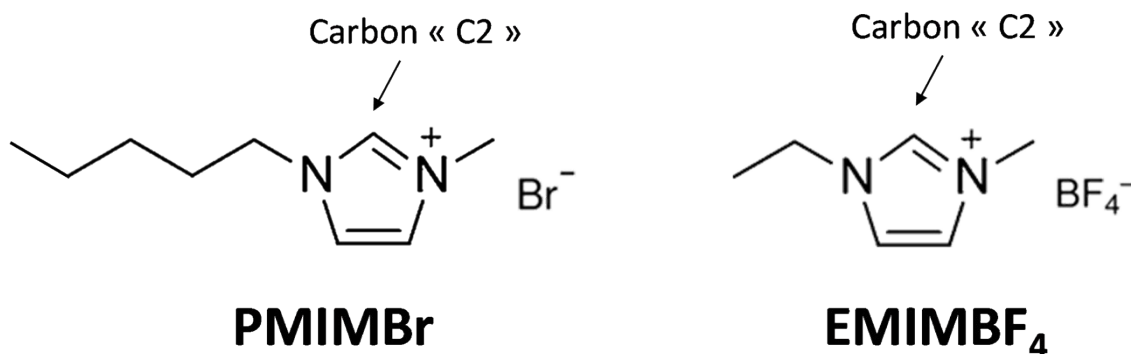
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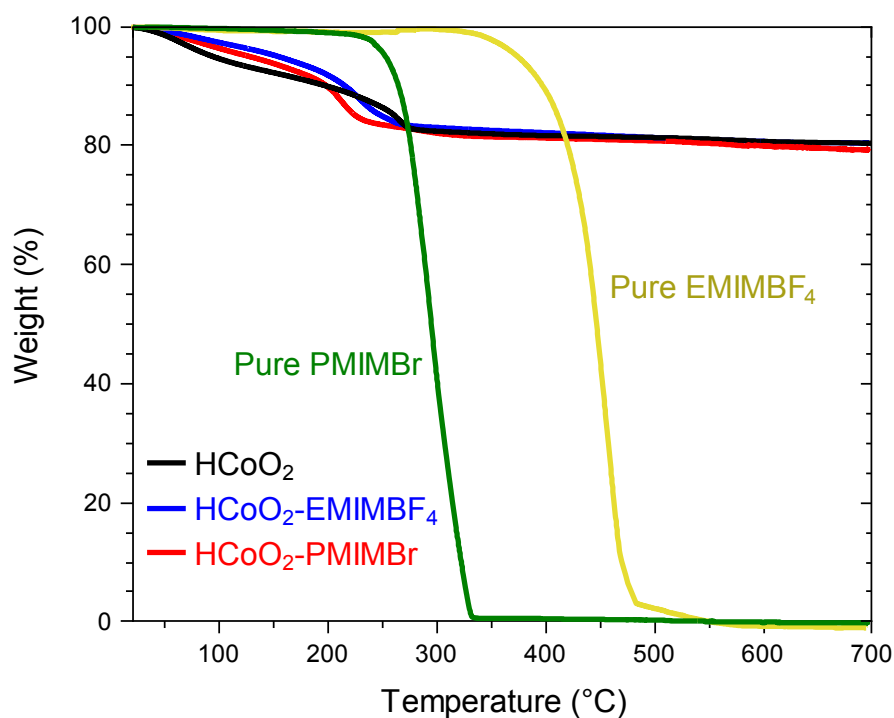
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Supplementary Information

S1. Representation of the ionic liquids and localization of the Carbon "C2" with an acidic hydrogen

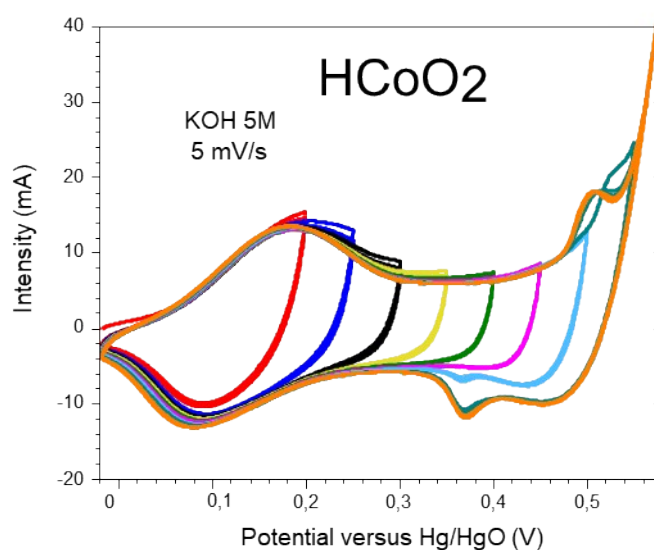


S2. Evolution of weight vs temperature during thermogravimetric analyses (TGA) of HCoO_2 , $\text{HCoO}_2\text{-EMIMBF}_4$, $\text{HCoO}_2\text{-PMIMBr}$ and of the pure ionic liquids for comparison sake.



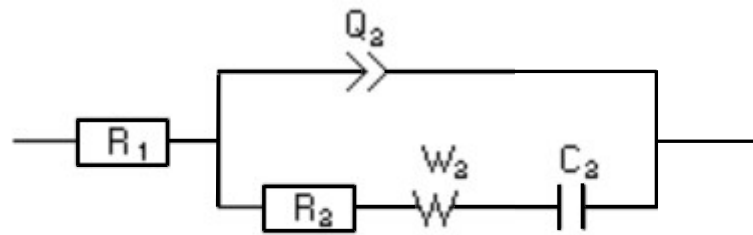
The TGA analyses show that the weight loss is calculated to be $\sim 21\%$ for $\text{HCoO}_2\text{-EMIMBF}_4$ and $\text{HCoO}_2\text{-PMIMBr}$, and 20% for HCoO_2 at 700°C . This result reveals that the quantity of ionic liquid is very low, as expected with a surface functionalization.

S3. Cyclic voltammetry curves of HCoO_2 in 5M-KOH at 5 mV/s



For HCoO_2 electrode material, the second oxidation peak relative to the Co(III)/Co(IV) redox couple is centered around 0.51 V and is overlapped with the oxygen evolution peak.

S4. Equivalent circuit used for the fitting of the EIS data



R_1 represents the bulk solution resistance, R_2 represents the faradic charge transfer resistance across the electrode/electrolyte interface, W_2 the Warburg element and C_2 a capacitor whereas a double layer capacitance Q_2 (Constant Phase Element) is connected parallel with R_2 .

S5. Cyclic voltammetry curves at different scan rates: a) HCoO_2 in 5M-KOH a) HCoO_2 in 0.5M- K_2SO_4 c) $\text{HCoO}_2\text{-EMIMBF}_4$ in 5M-KOH a) $\text{HCoO}_2\text{-EMIMBF}_4$ in 0.5M- K_2SO_4 e) $\text{HCoO}_2\text{-PMIMBr}$ in 5M-KOH f) $\text{HCoO}_2\text{-PMIMBr}$ in 0.5M- K_2SO_4

