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Design of High Surface Area Poly(Ionic Liquid)s to Convert Carbon Dioxide into Ethylene Carbonate

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1. IR-ATR spectra collected in air of the non-ionic homo-polymers and co-polymers

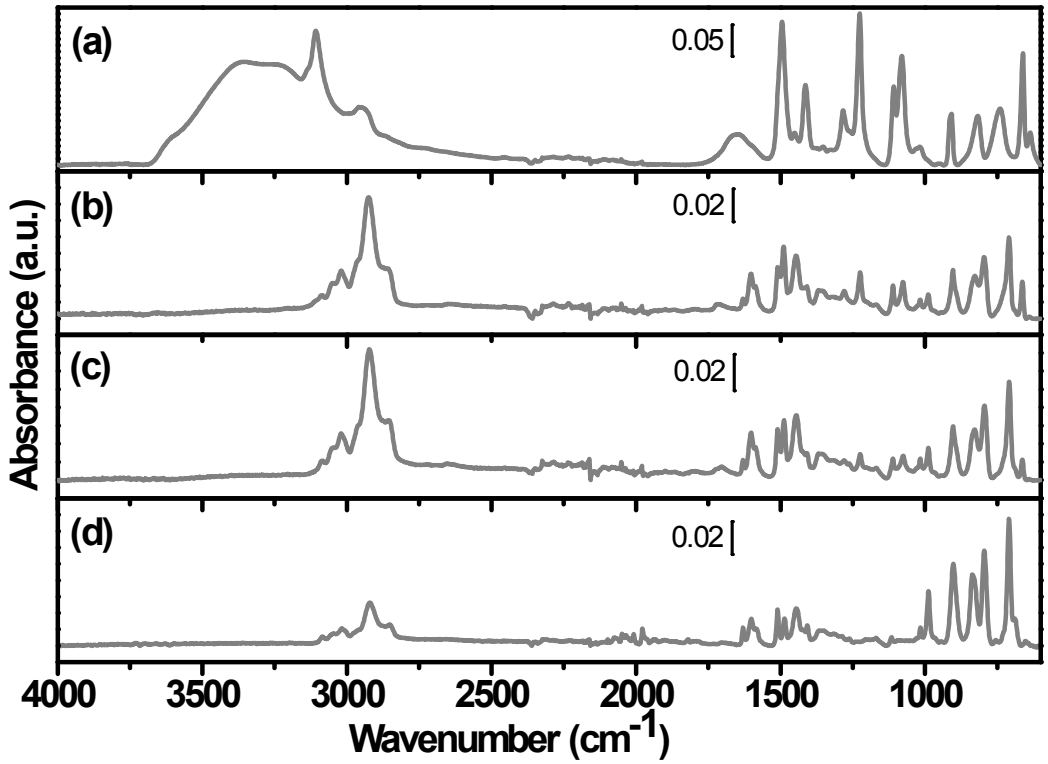

Figure S1. IR-ATR spectra collected in air in the 4000-600 cm^{-1} range of Poly(VIm) (a); Poly(DVB-co-VIm) 5:5 (b); Poly(DVB-co-VIm) 3:7 (c); Poly(DVB) (d)

2. IR-ATR spectra showing the change of the PILs spectral feature after the anion exchange

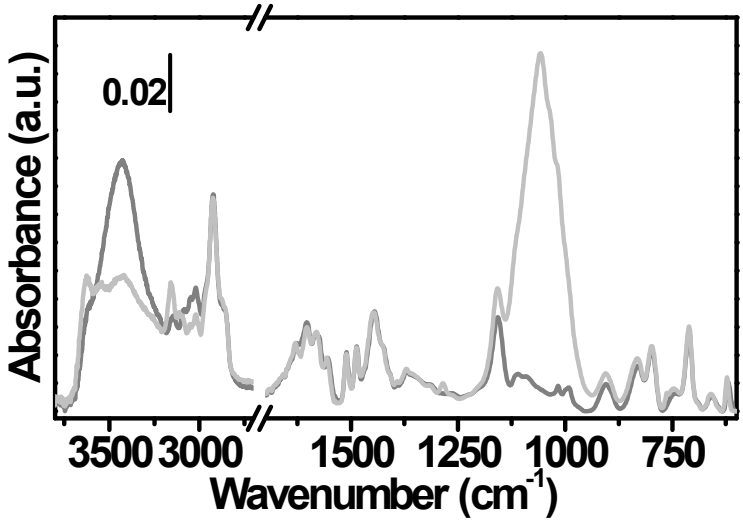

Figure S2. IR-ATR spectra in air of neat **2a** (dark grey curve) and after the anion exchange that leads to **2d** (light grey curve). Bands at 1060 cm^{-1} and at 3152 cm^{-1}, ascribable to the stretching of BF_4^-, anion are clearly visible.

3. Thermo Gravimetric Analysis showing the thermal decomposition of co-polymers and PILs

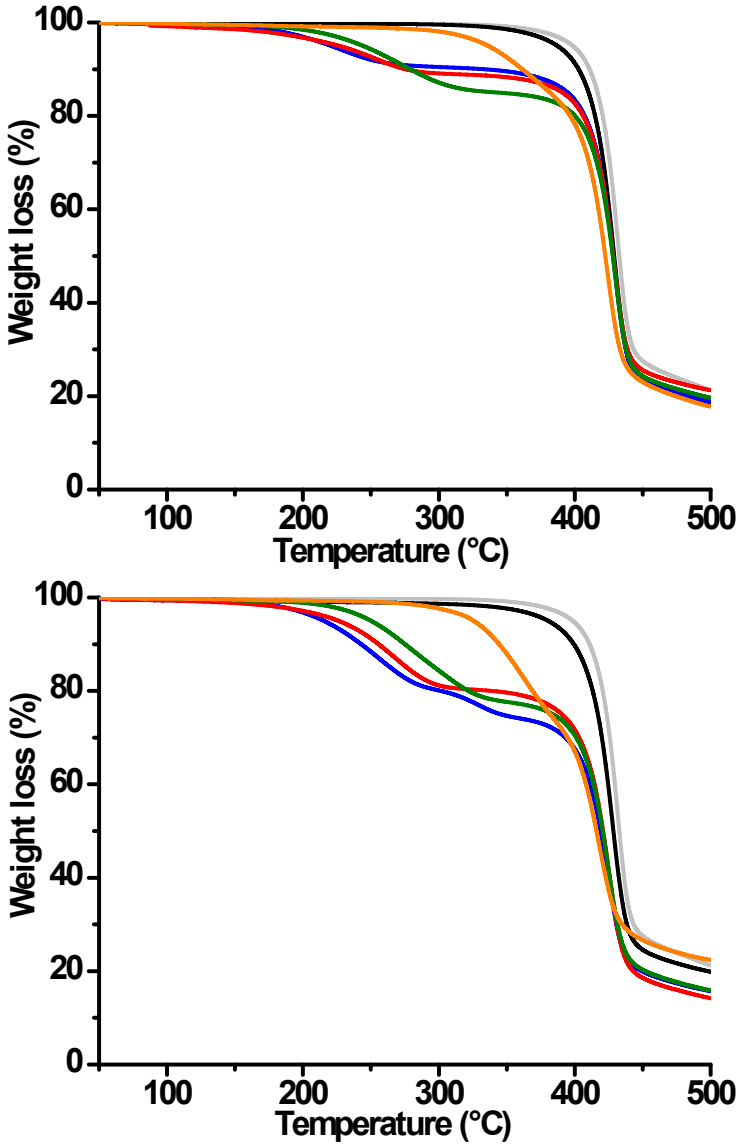

Figure S3. TGA profile for Poly(DVB) (grey), **1** and **2** (black), **1a** and **2a** (blue), **1b** and **2b** (green curve), 1**c** and **2c** (red), **1d** and **2d** (orange). Top part refers to polymer and PILs of series **1,** while bottom part refers to polymer and PILs of series **2**

4. Adsorption and desorption isotherm in N_2 at 77K of co-polymers and PILs

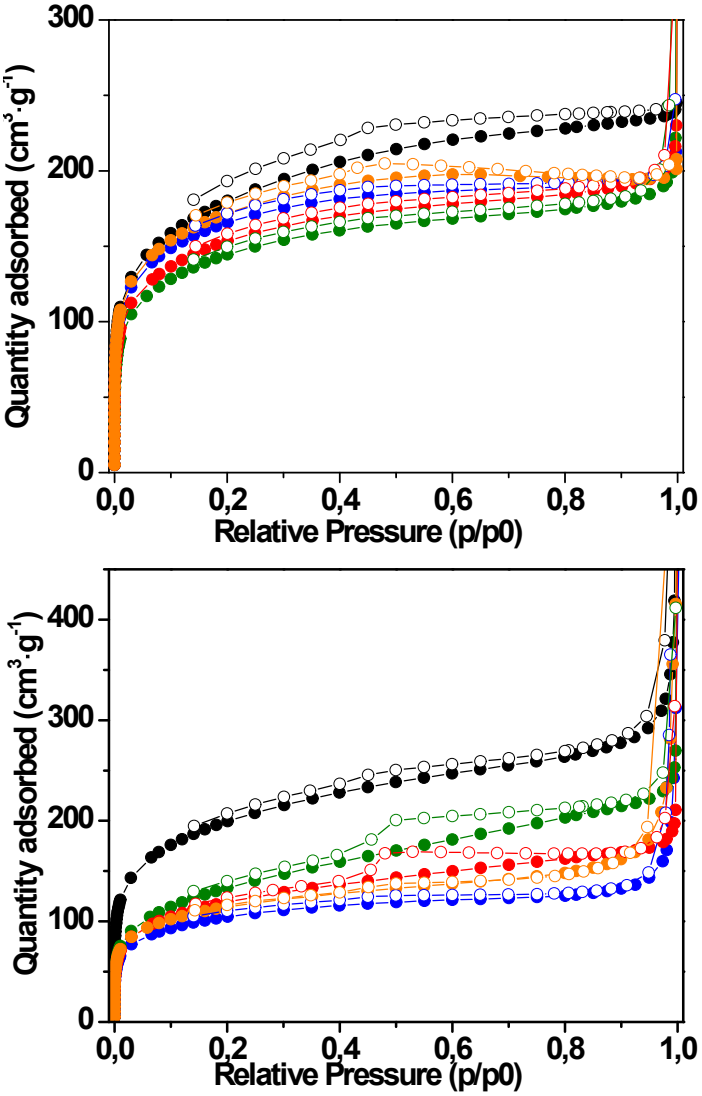

Figure S4. Adsorption and desorption isotherms obtained with N_2 at 77K of: **1** and **2** black curves, **1a** and **2a** blue curves, **1b** and **2b** green curves, **1c** and **2c** red curves, **1d** and **2d** orange curves. Top part shows the PILs of series **1,** bottom part shows the PILs of series **2**

5. **Pore size distribution obtained from QSDFT analysis of the N_2 adsorption isotherm of co-polymers and PILs**

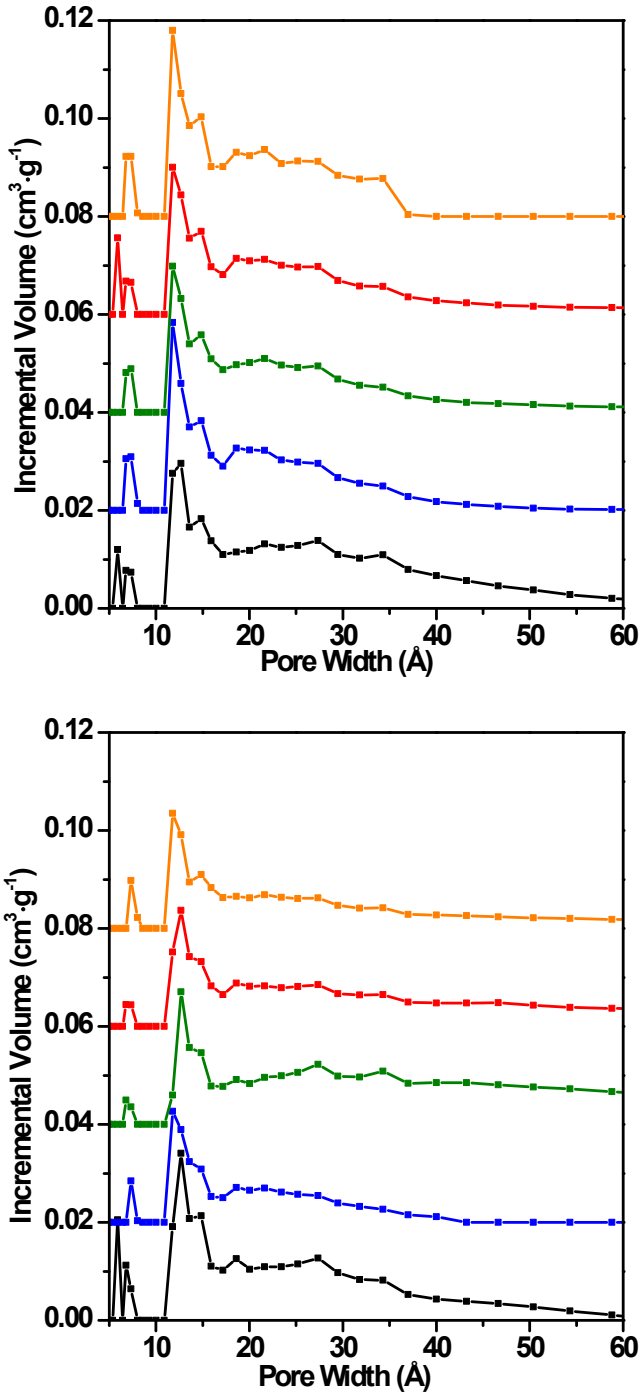

Figure S5. Pore size distribution obtained from QSDFT analyses of N_2 adsorption isotherm at 77K using carbon with slit and cylinder pore as a model: **1** and **2** black curves, **1a** and **2a** blue curves, **1b** and **2b** green curves, **1c** and **2c** red curves, **1d** and **2d** orange curves. Left part shows the PILs of series **1,** Right part shows the PILs of series **2.** The curves are 0.02 $cm^3 \cdot g^{-1}$ staked for the sake of easy view.

6. SEM image of homo-polymers

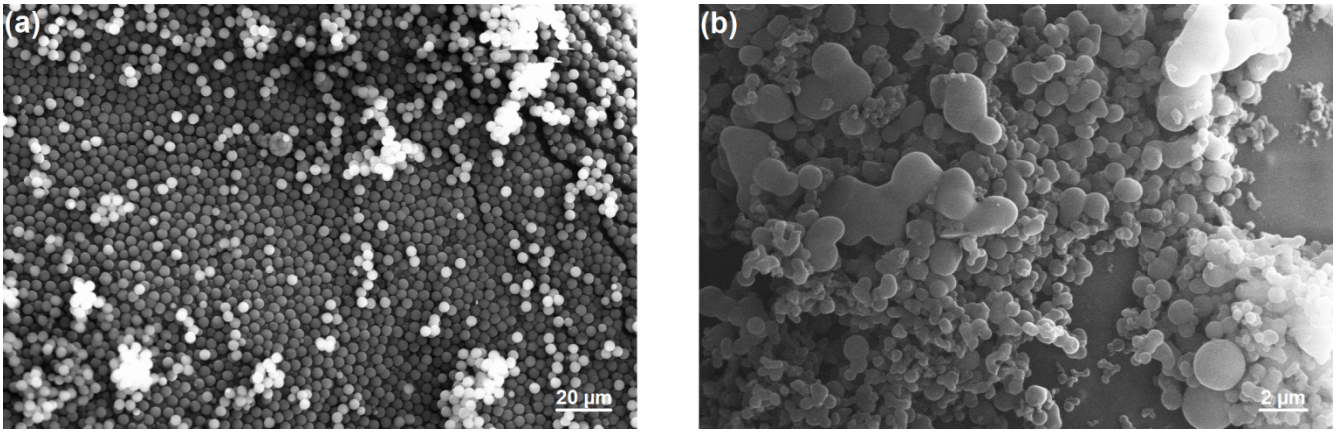

Figure S6. SEM images of poly(DVB) (a) and poly(VIm) (b)

7. EC evolution on reference sample

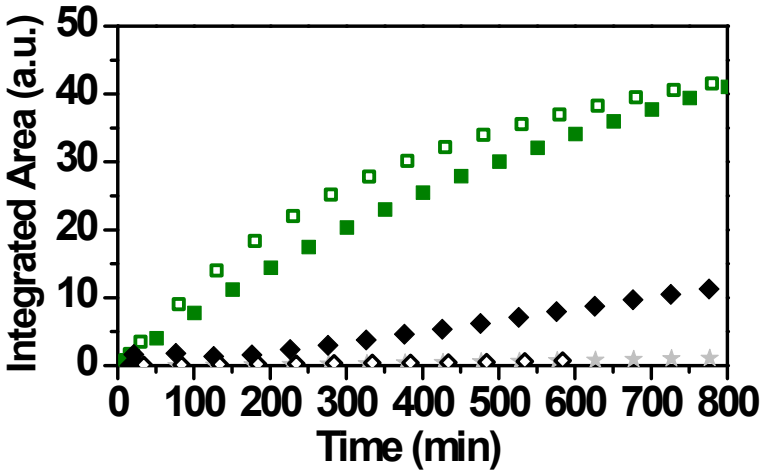

Figure S7. Integrated area of the IR absorption band at 1805 cm^{-1} (corresponding to the EC yield) monitored as a function of reaction time for **1** black diamond, **2** black open diamond, **1b** green square, **2b** green open square, **Poly(mVIm$^+$I$^-$)** gray star.

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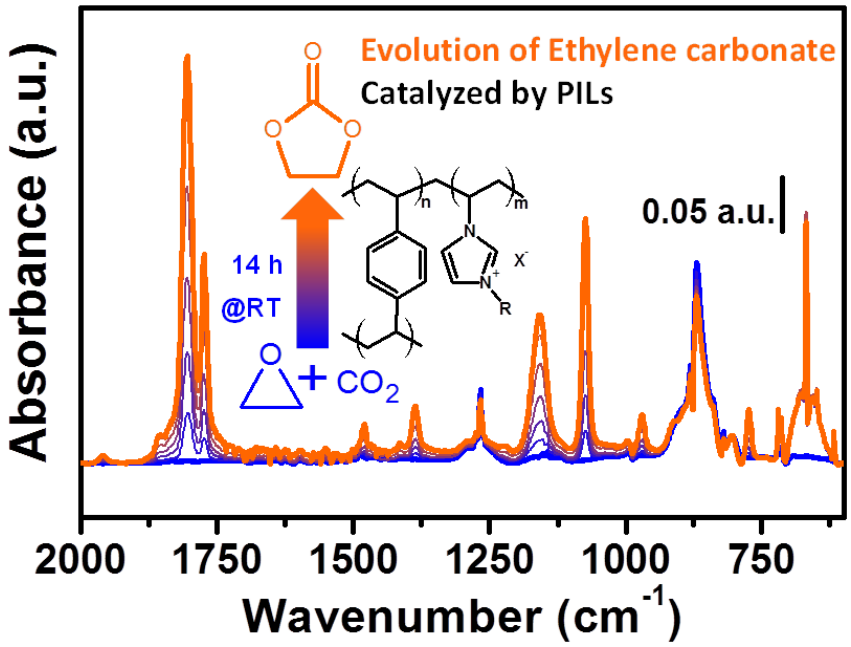
Evolution of Ethylene carbonate
Catalyzed by PILs
0.05 a.u.
14 h
@RT
+ CO2
Absorbance (a.u.)
2000
1750
1500
1250
1000
750
Wavenumber (cm-1)