Supporting Information

Valorization Strategies in CO_2 capture: A New Life for Exhausted Silica-Polyethylenimine

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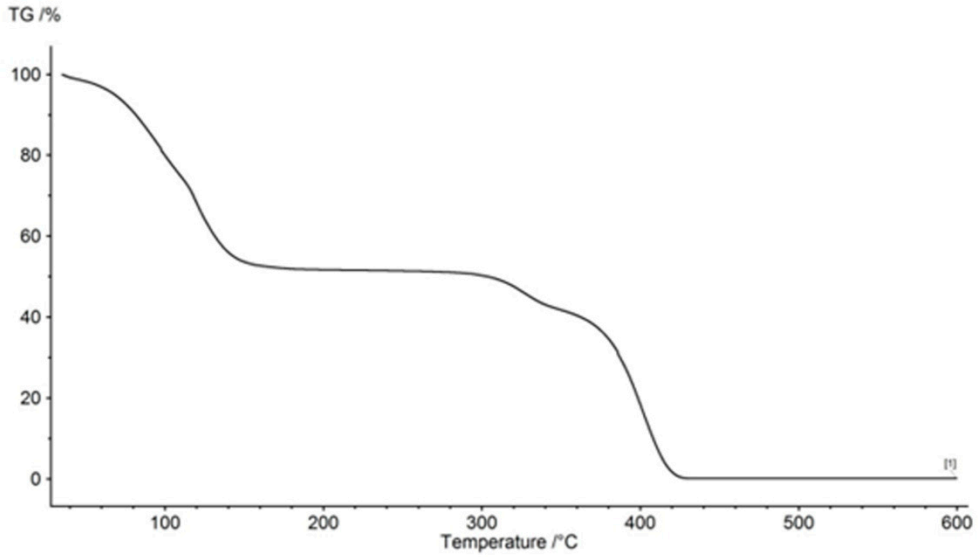


Figure S1. TGA thermogram of PEI 5k in nitrogen atmosphere.

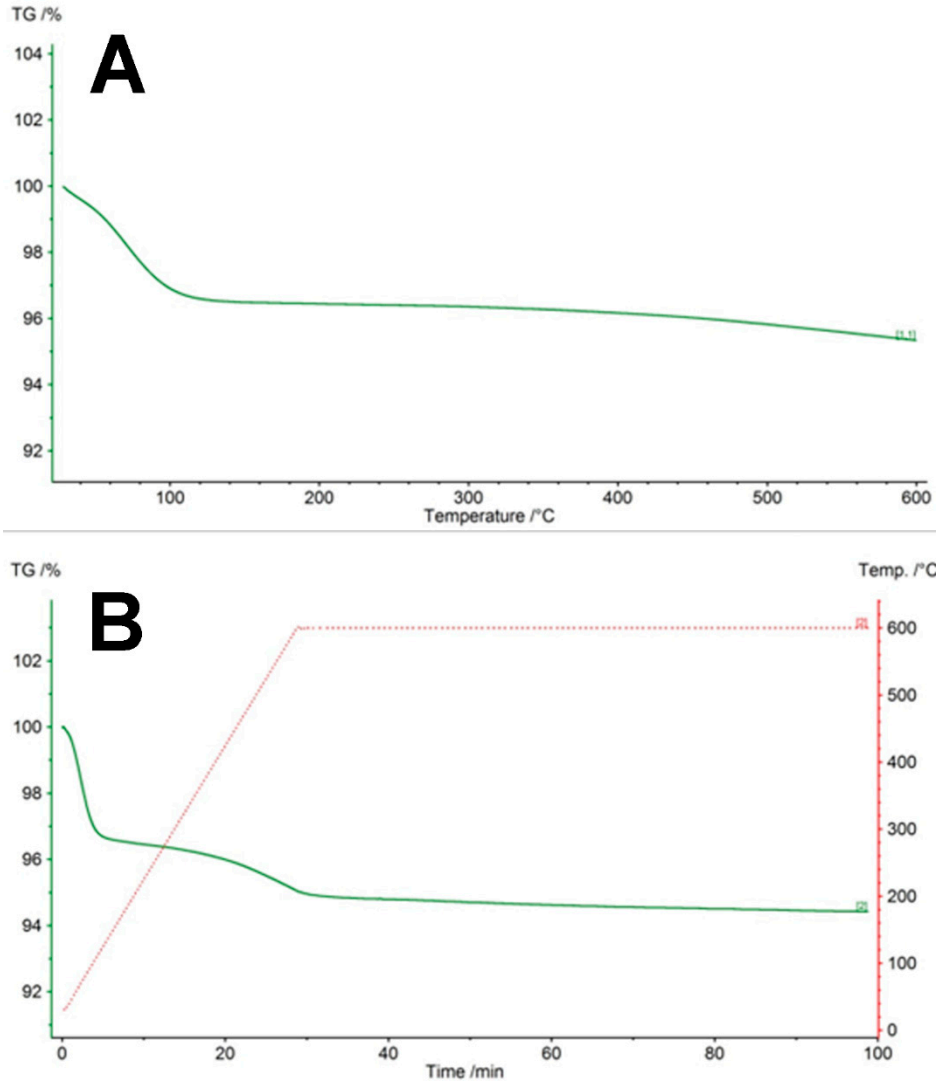


Figure S2. TGA thermogram of Silica PQ4: A) heating ramp in nitrogen atmosphere; B) the whole analysis comprising a first heating ramp and the subsequent isotherm step in air. The latter is in time scale, and in red dotted line the applied temperature ramp is described.

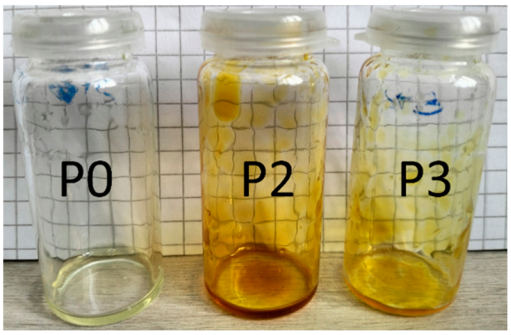


Figure S3. Example of the extracted polymers: P0, P2 and P3.

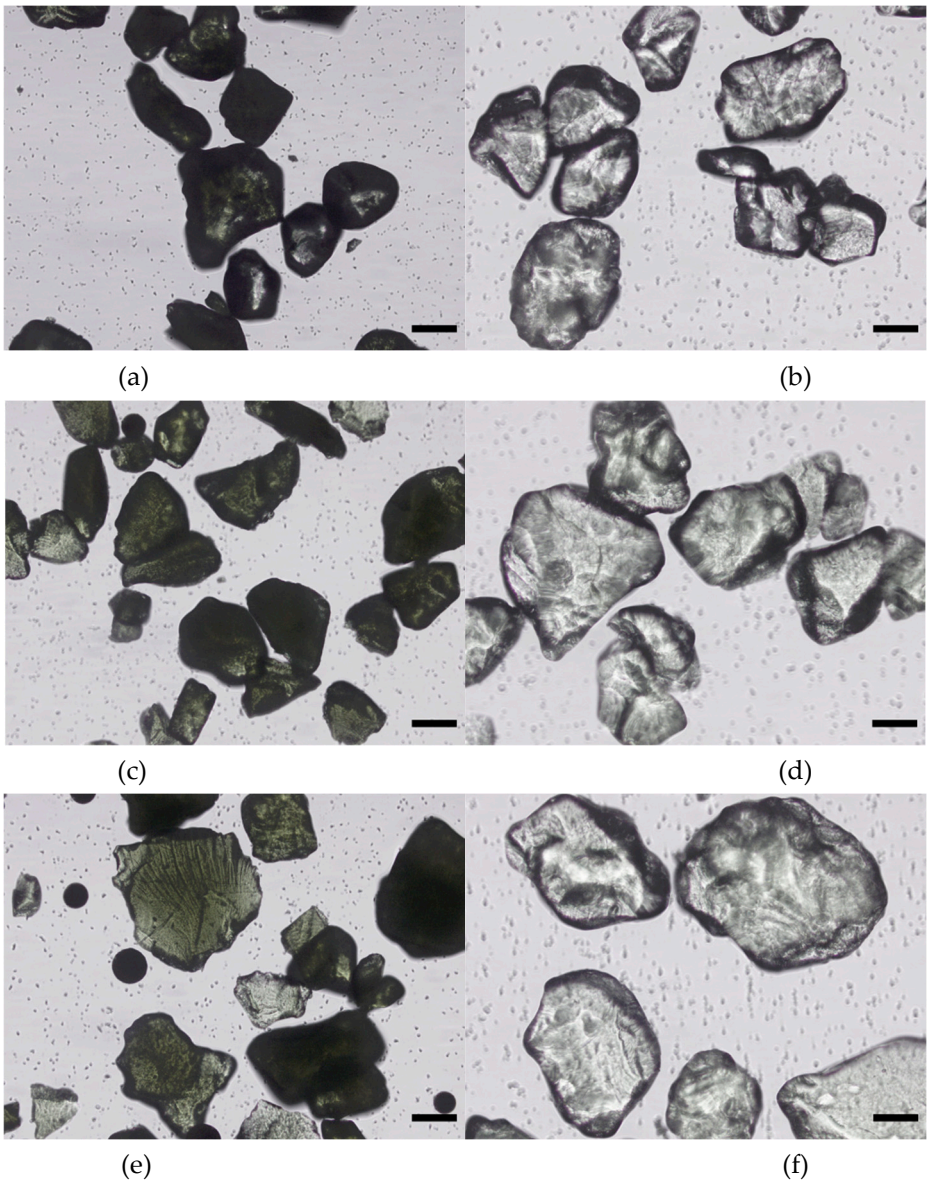


Figure S4. Optical microscope images of pre- and post-extraction grains of Si-PEI samples, left and right column, respectively. The pictures (a) and (b), (c) and (d), (e) and (f) correspond to the microscopically magnified SP0 and S0, SP2 and S2, SP3 and S3 samples, respectively. Scalebar: 100 μm.

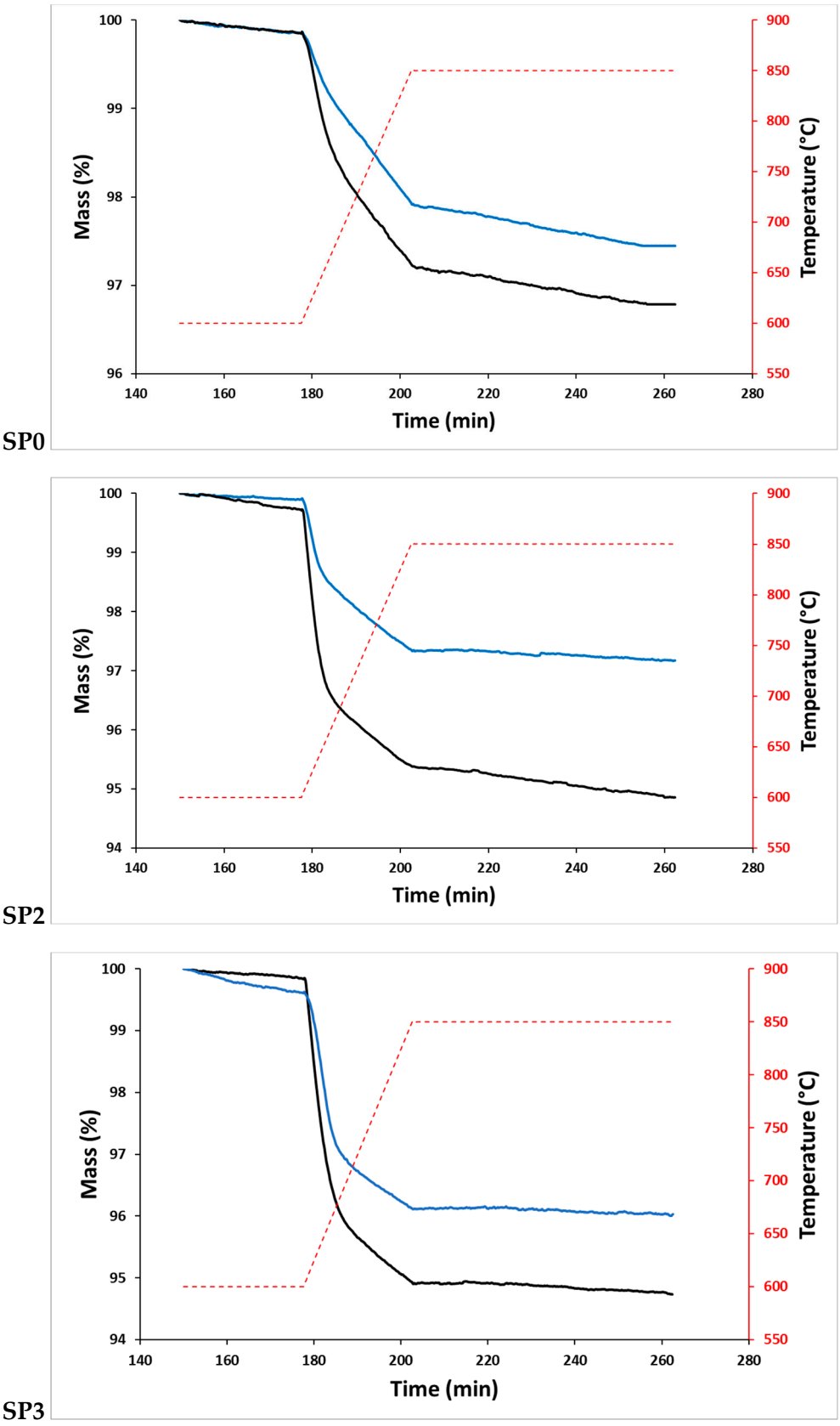
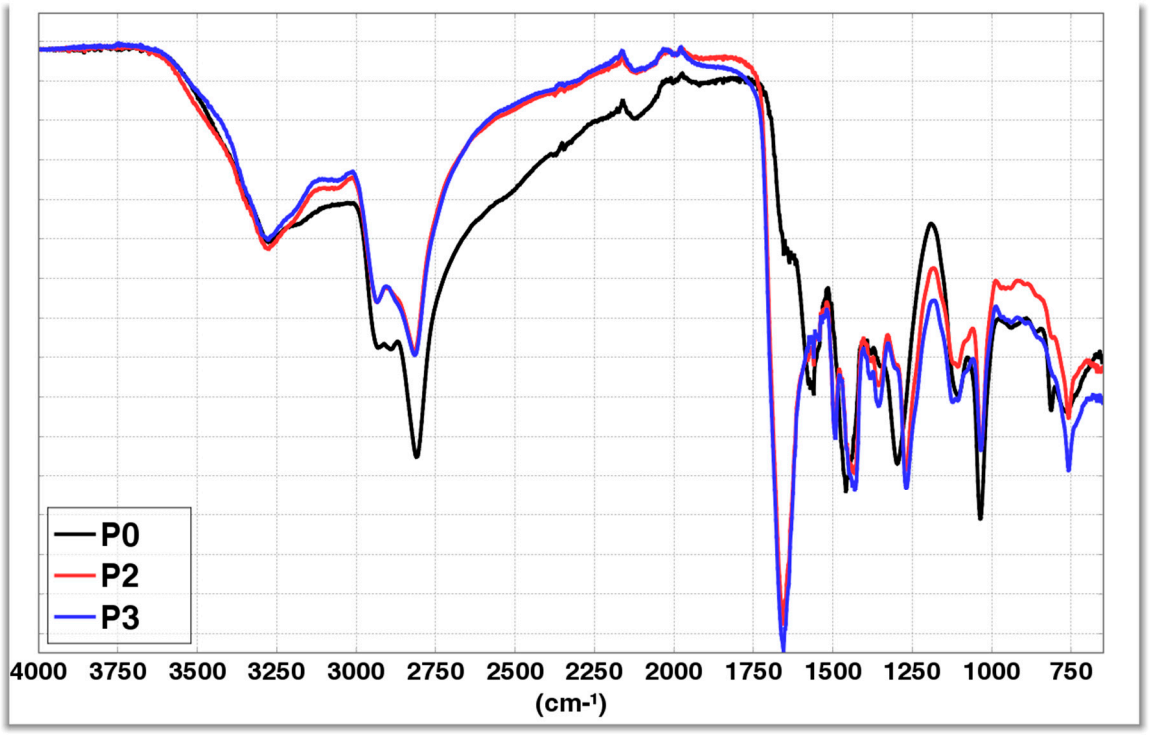
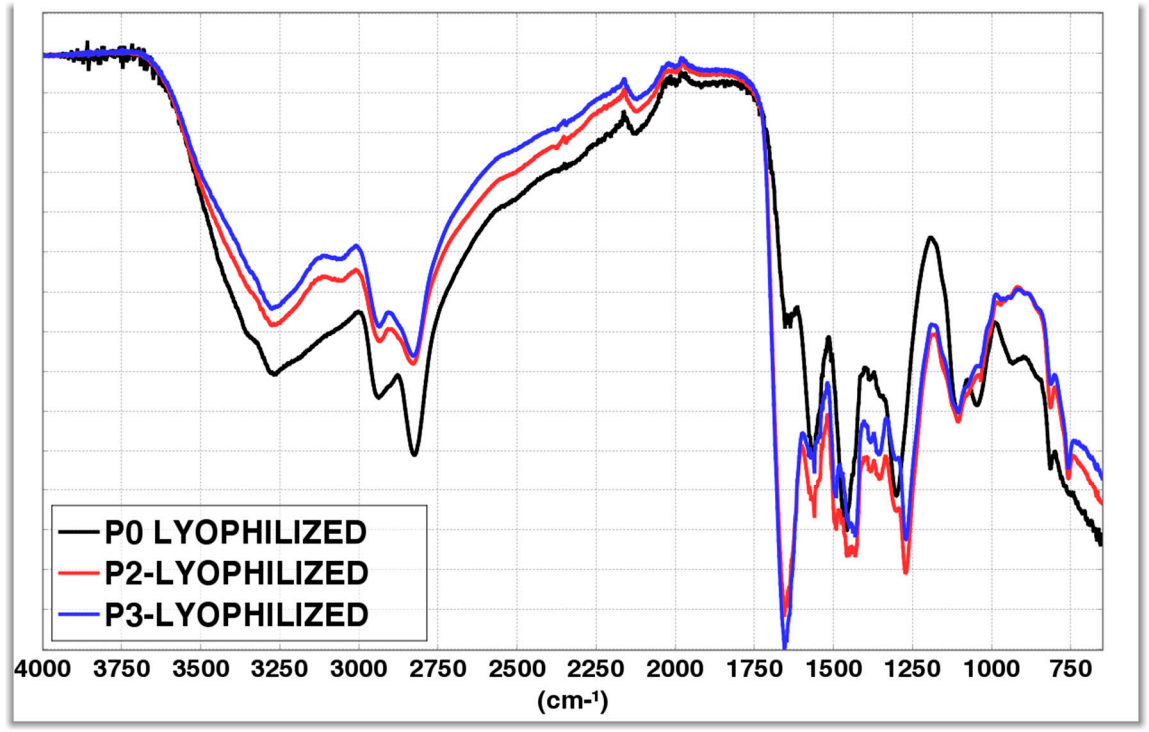


Figure S5. TGA thermograms of SPx thermo-degraded in nitrogen atmosphere in order to simulate a pyrolysis cycle.


P0
P2
P3
4000 3750 3500 3250 3000 2750 2500 2250 2000 1750 1500 1250 1000 750
(cm-1)

(a)


P0 LYOPHILIZED
P2-LYOPHILIZED
P3-LYOPHILIZED
4000 3750 3500 3250 3000 2750 2500 2250 2000 1750 1500 1250 1000 750
(cm-1)

(b)

(c)

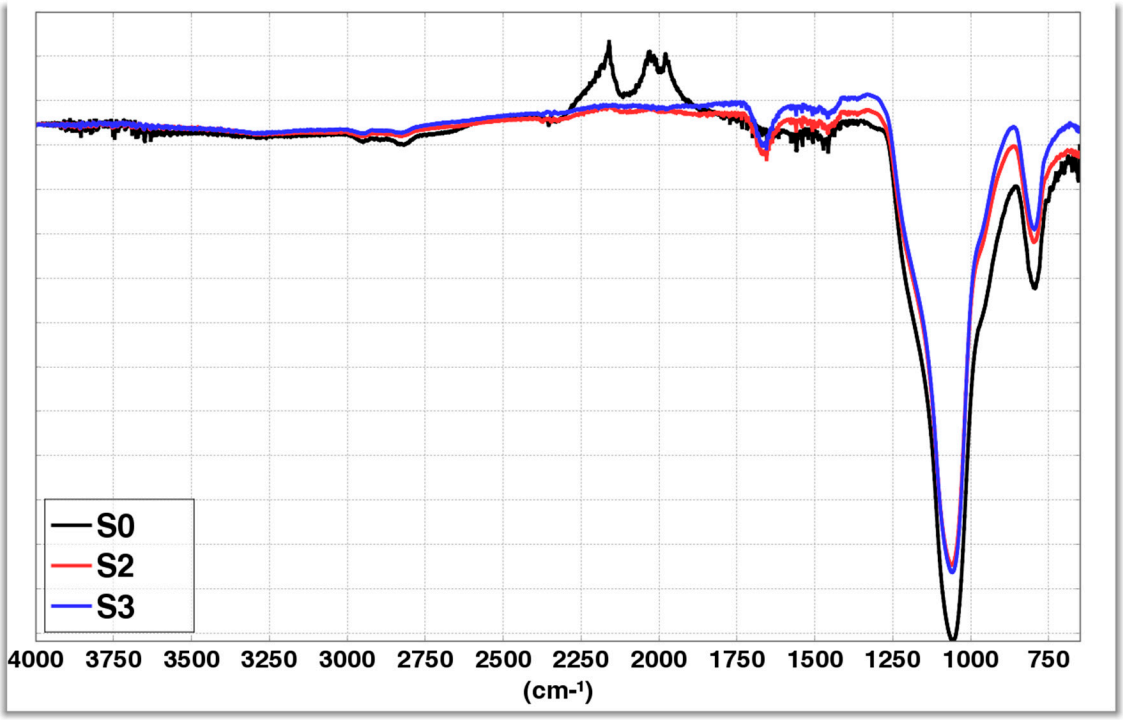


Figure S6. ATR-FTIR of the extracted PEI (Px, a), lyophilized extracted PEI (lyophilized Px, b) and silica-remaining sample after PEI extraction (Sx, c). VMS-DRAW [1] has been used to plot the corresponding spectra.

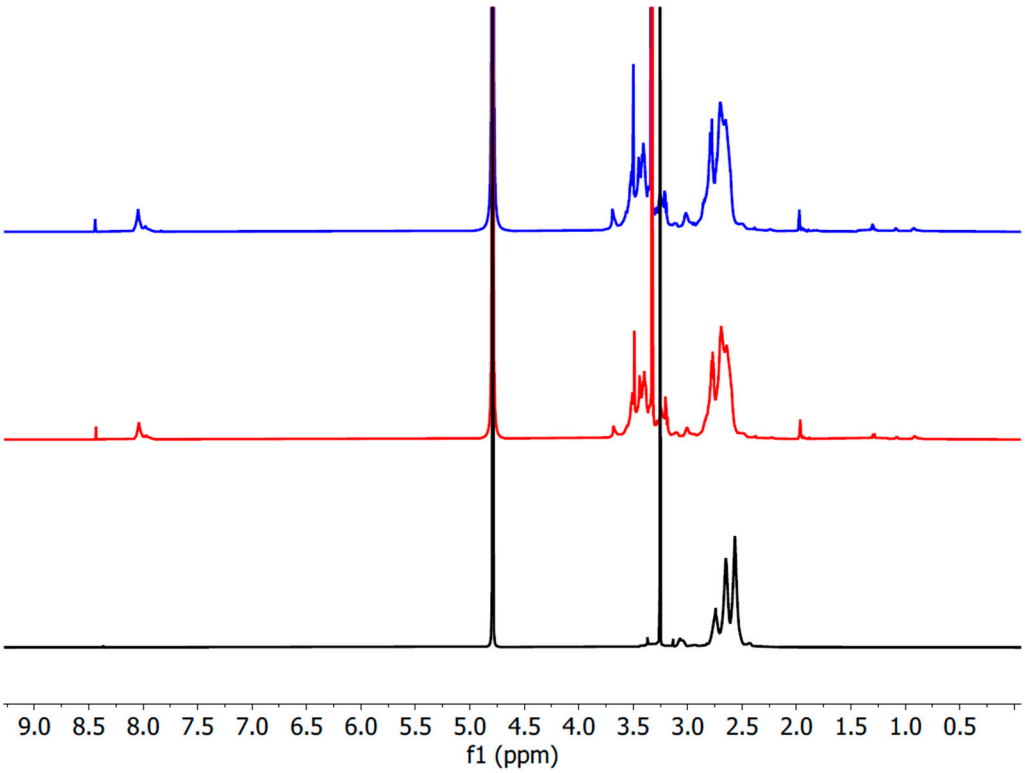


Figure S7. ^{1}H NMR spectrum of extracted PEI samples: P0 (black), P2 (red) and P3 (blue).

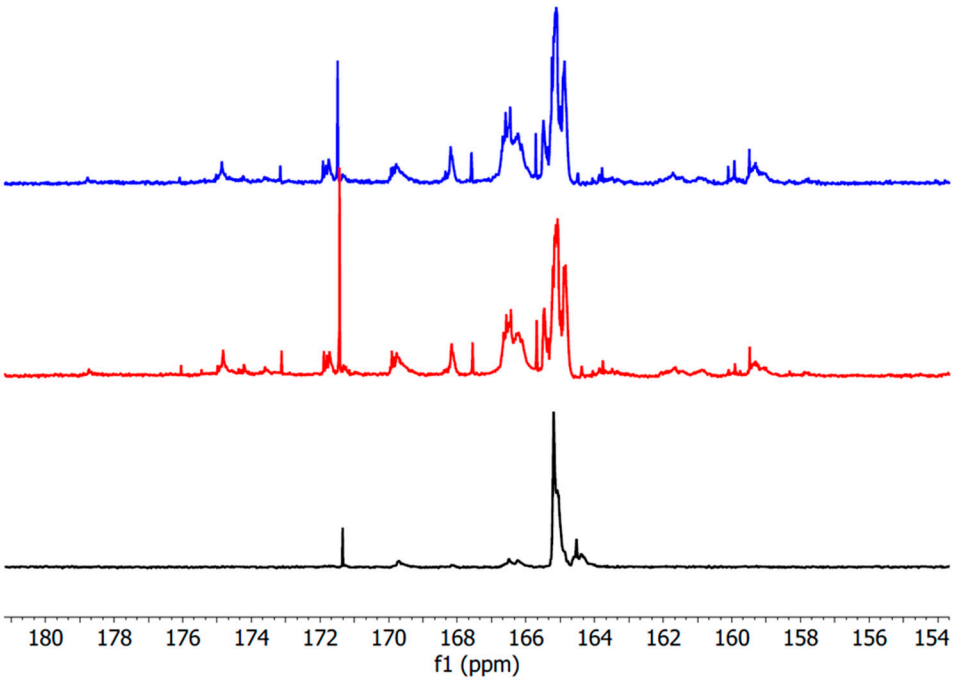


Figure S8. ^{13}C NMR spectrum (zoom between 155 and 180 ppm) of extracted PEI samples: P0 (black), P2 (red) and P3 (blue).

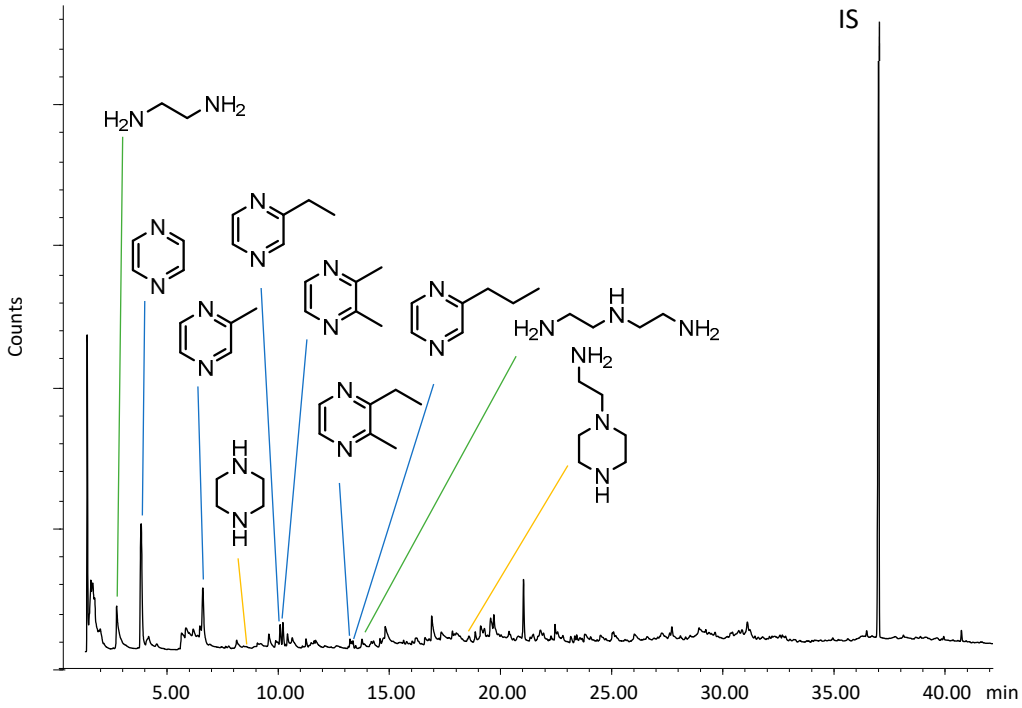


Figure S9. MS-pyrograms from Py-GC-MS at 600 °C of PEI 5k. IS stands for internal standard.

Reference:

1. Licari, D.; Baiardi, A.; Biczysko, M.; Egidi, F.; Latouche, C.; Barone, V. Implementation of a Graphical User Interface for the Virtual Multifrequency Spectrometer: The VMS-Draw Tool. *J Comput Chem* **2015**, *36*, 321–334, doi:https://doi.org/10.1002/jcc.23785.