

## **Supporting Information**

### **Oxidative Degradation of Silica-supported Polyethylenimine for CO<sub>2</sub> Adsorption: Insights into the Nature of Deactivated Species**

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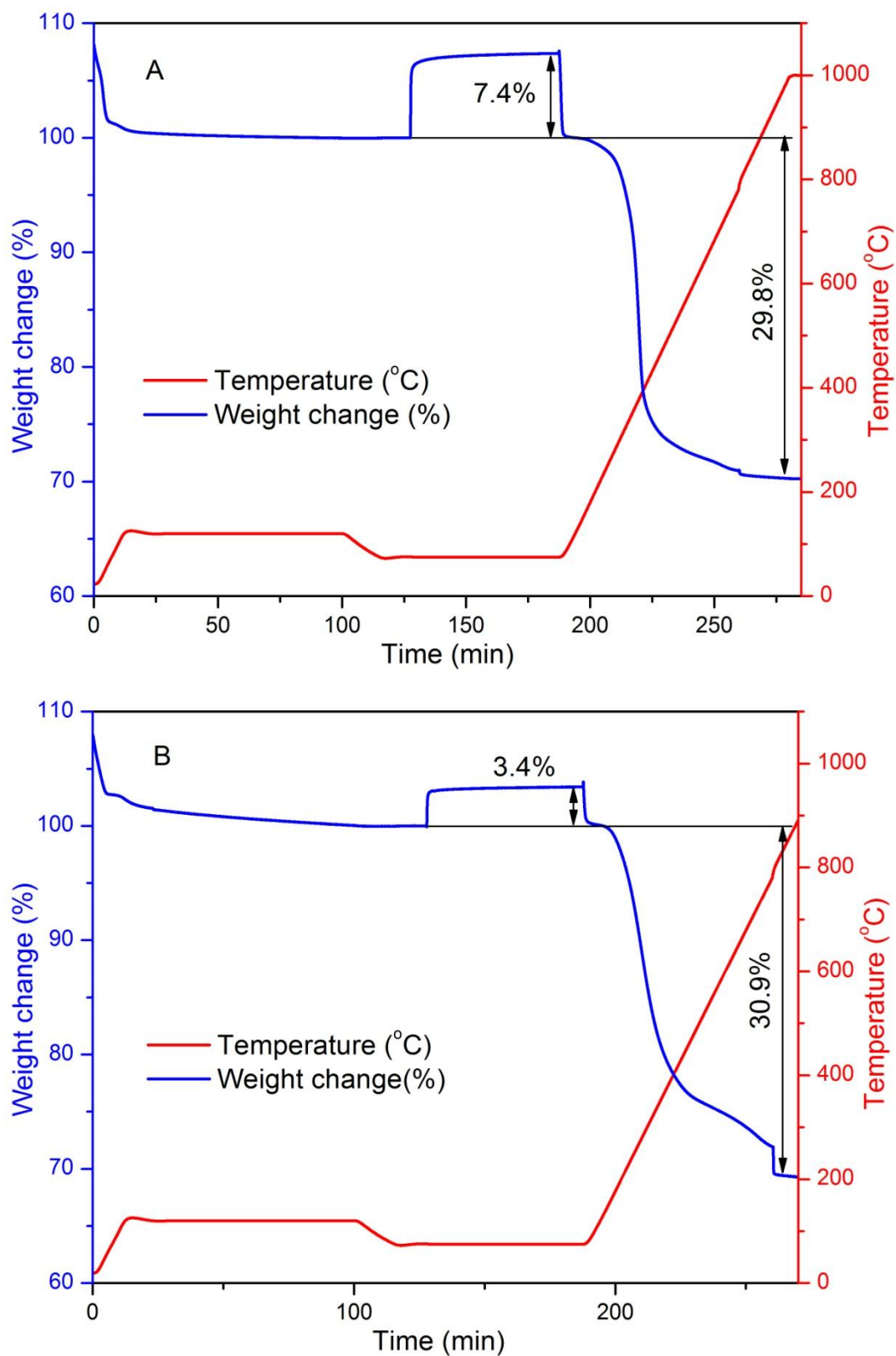


Fig. S1 CO<sub>2</sub> adsorption of LPEI before (A) and after (B) deactivation.

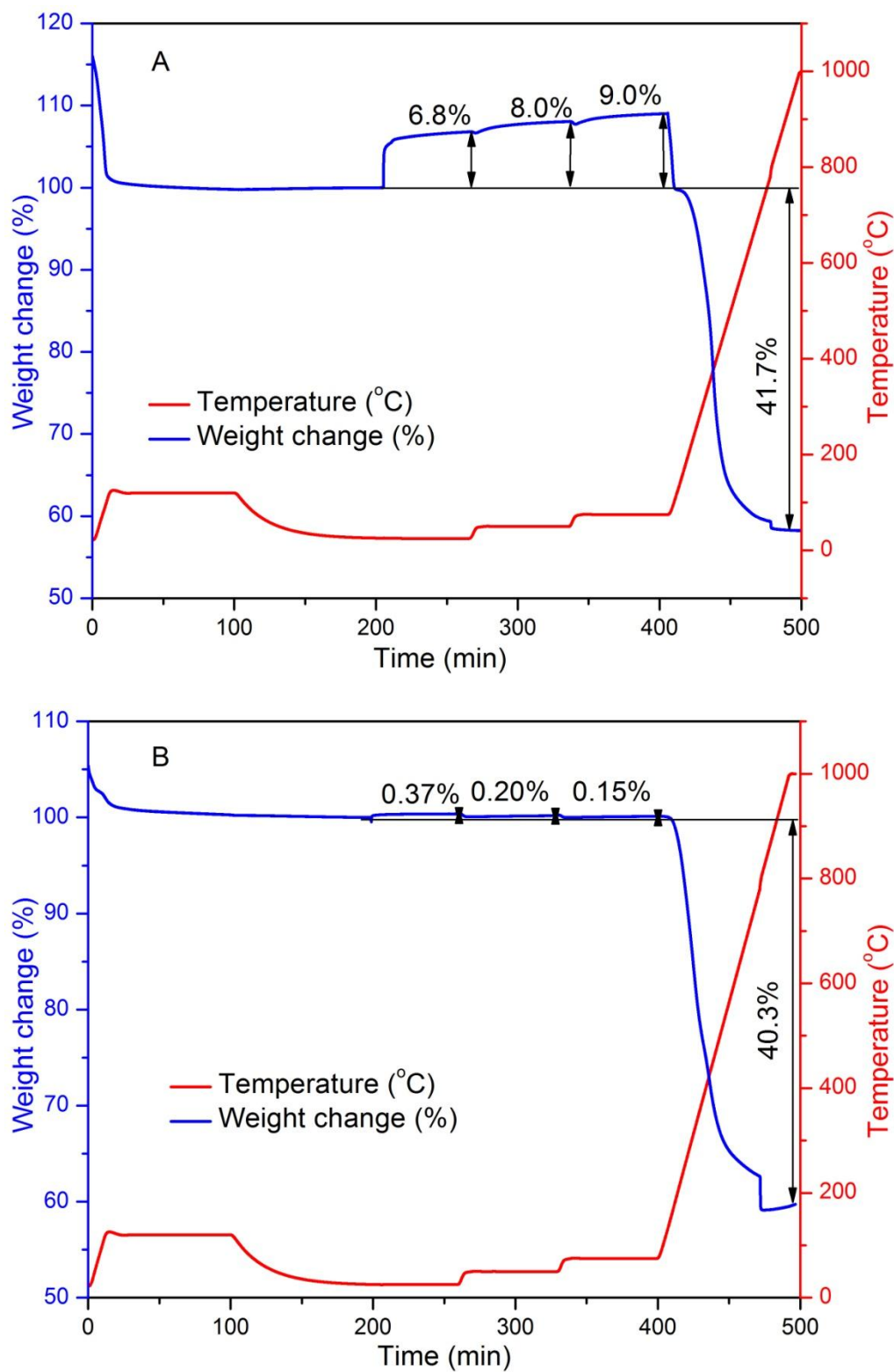


Fig. S2 CO<sub>2</sub> adsorption of BPEI before (A) and after (B) deactivation.

Table S1 CO<sub>2</sub> uptake of the adsorbent before and after deactivation.

Sample	Air treatment <sup>(a)</sup>	CO <sub>2</sub> uptake (%) at 75 °C		Degree of deactivation (%)
		Before air-treatment	After air-treatment	
LPEI	110 °C	7.4	3.4	54
BPEI	120 °C	9.0	0.15	98

<sup>(a)</sup> air treatment for 24 h.

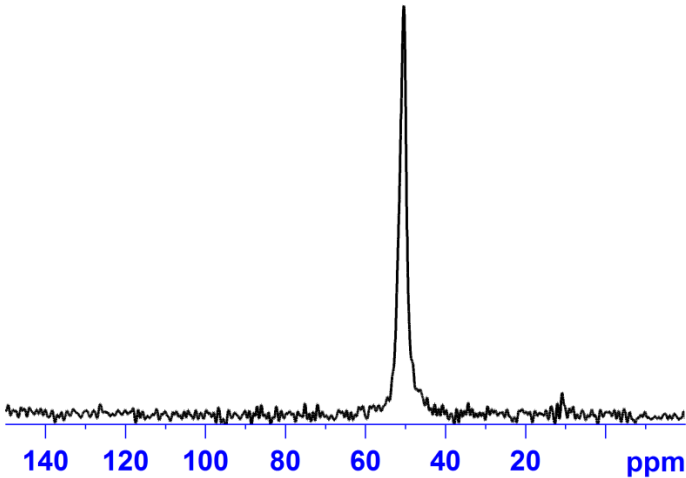


Fig. S3 <sup>13</sup>C NMR spectrum of fresh LPEI.

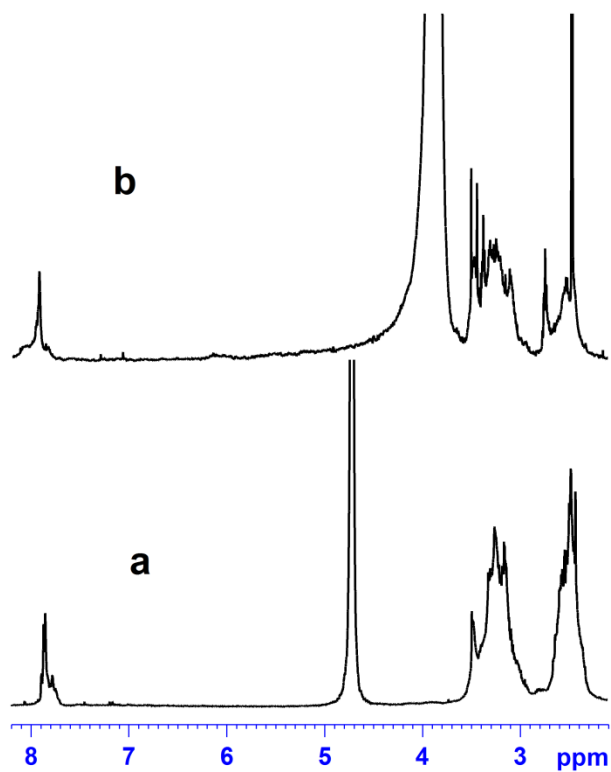


Fig. S4 <sup>1</sup>H NMR spectrum of BPEI solution in a) 1.5 mM KOH/D<sub>2</sub>O, and b) DMSO-d<sub>6</sub> deactivated in air at 110 °C for 24 h.

In Figure S4b, the broad peak centered at 3.7 ppm originates from hygroscopic properties of DMSO and is assigned to H<sub>2</sub>O in DMSO-d<sub>6</sub>. In addition, <sup>1</sup>H-<sup>13</sup>C HMQC NMR of this solution was devoid of any correlations between this proton and a carbon atom.

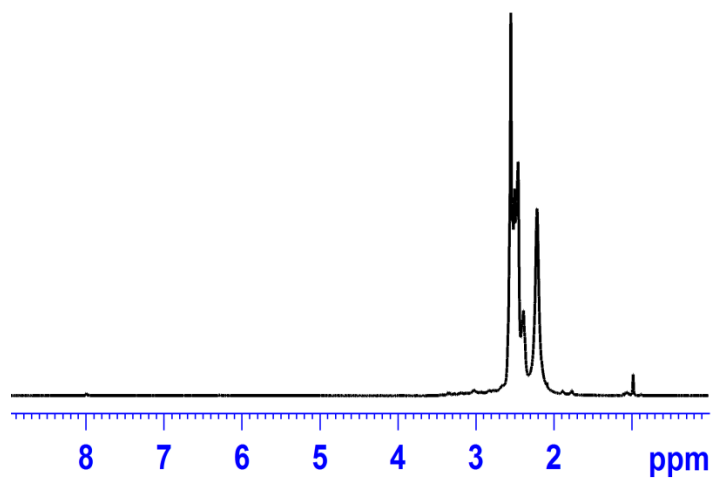


Fig. S5  $^1\text{H}$  NMR spectrum of fresh BPEI in  $\text{DMSO-d}_6$ .

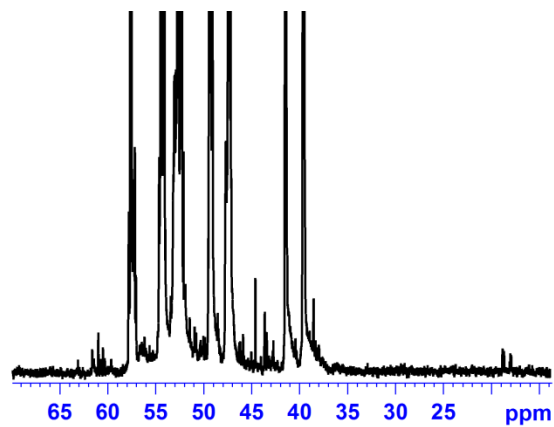


Fig. S6  $^{13}\text{C}$  NMR spectrum of fresh BPEI in  $\text{DMSO-d}_6$ .

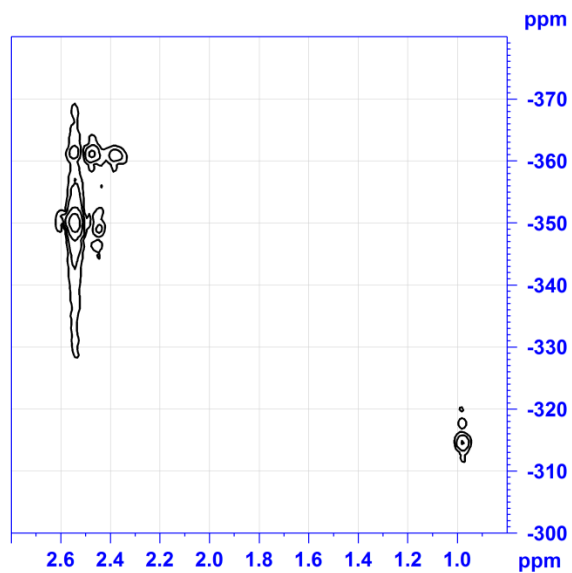


Fig. S7  $^1\text{H}$ - $^{15}\text{N}$  HMBC NMR spectrum of fresh BPEI.

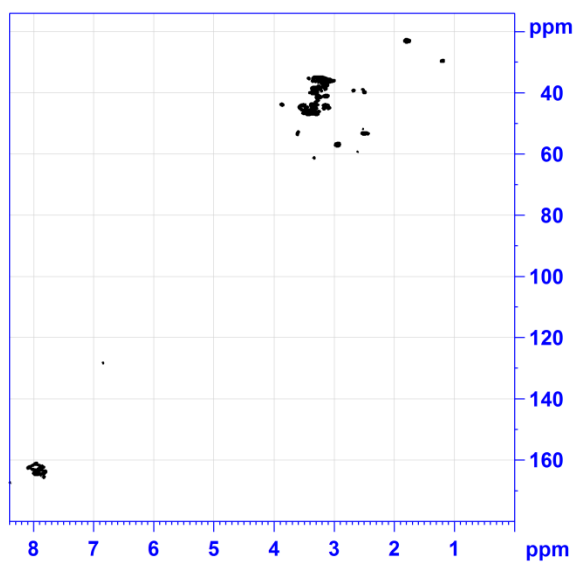


Fig. S8  $^1\text{H}$ - $^{13}\text{C}$  HMQC NMR spectrum of air-deactivated BPEI in  $\text{DMSO-d}_6$ .

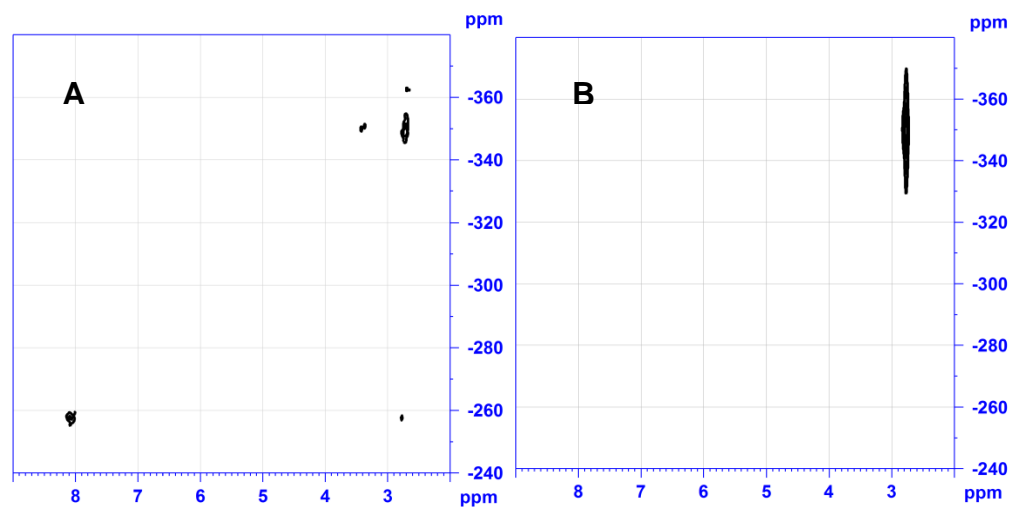


Fig. S9  $^1\text{H}$ - $^{15}\text{N}$  HMBC spectrum of (A) air-deactivated LPEI, and (B) fresh LPEI.