Supplemental information

1. SEM images and EDS spectra of PAN-PK and PAN-OK

The contents of residual potassium in PAN-PK and PAN-OK were detected by energy dispersive spectroscopy (EDS) analysis, which was carried out on a JEOL JSM 6460 LA scanning electron microscope equipped with an EDS JED 2300. Before the analysis, the sample was coated with Au.

![SEM images and EDS spectra of PAN-PK (a, c) and PAN-OK (b, d)](image)

Figure S1 SEM images and EDS spectra of PAN-PK (a, c) and PAN-OK (b, d)

Figure S1 shows the SEM images and EDS spectra of PAN-PK and PAN-OK. No residual potassium was detected by EDS, indicating that the KOH used for the chemical activation was completely neutralized and washed away by HCl aqueous solution and H\textsubscript{2}O. This is further confirmed by the fact that no potassium was detected by elemental analysis.
2. Adsorption of CO₂ on PAN-ACFs after adsorption of N₂

![Graph](#)

Figure S2 The adsorption isotherms of CO₂ on PAN-ACFs after adsorption of N₂, as measured by the thermogravimetric analyzer
3. Desorption of CO₂ and H₂O from PAN-PK and zeolite 13X

The desorption curves of CO₂ and H₂O from PAN-PK and zeolite 13X were measured on a PFEIFFER Vacuum OmniStar™ Mass Spectrum Analyzer. The typical procedures are as follows: 0.2 g sample was packed into a stainless steel reactor with a diameter of 1 cm and placed into an electric furnace at atmospheric pressure. Then, it was blown with a CO₂ flow with 3 vol.% of H₂O at 25 °C for 120 min. This was followed by heating the sample from room temperature to 400 °C at a rate of 5 °C/min in an argon flow. The outlet CO₂ and H₂O concentrations were recorded by the Mass Spectrum Analyzer.

![Desorption curves of CO₂ and H₂O from PAN-PK (a) and zeolite 13X (b) at atmospheric pressure](image)

Figure S3 CO₂ and H₂O desorption curves of PAN-PK (a) and zeolite 13X (b) at atmospheric pressure