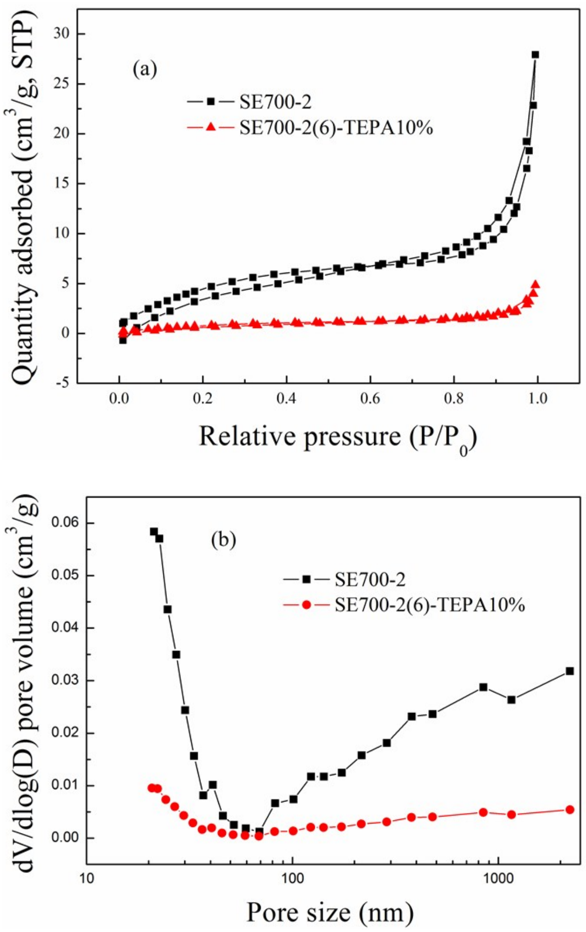

Figure 1S. The (a) N_2 adsorption isotherms and (b) pore size distribution curves for SE700-2 and SE700-2(6)-TEPA10%.

Before and after TEPA-functionalization, the activated semicoke showed a typical type-IV adsorption isotherm and H3 hysteresis loop at relatively high pressure, suggesting that crack-type mesopores existed in the activated semicoke. Moreover, the isotherm didn't reach saturation at relative pressure of 1.0, showing that macropores formed and the pore structure was irregular. As shown in Figure 1S(b), the pore size distribution for SE700-2 was wide; after 10 wt.% TEPA loading, some pores were filled, while partial pores still existed and provided room for TEPA dispersion and CO_2 diffusion.

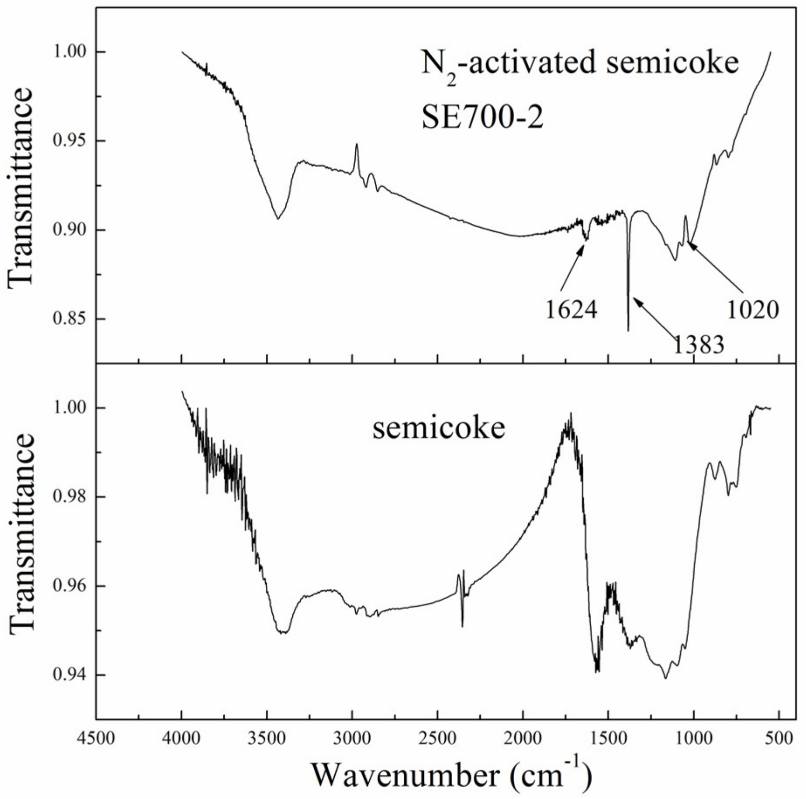

Figure 2S. The FT-IR spectrum for the activated semicoke of SE700-2.

Comparing with the semicoke, the peaks for SE700-2 at 1020 and 1383 cm^{-1} appeared, which separately represented the asymmetric stretching vibration of C-O-C in the aliphatic and aromatic ether. The new peak centering at 1624 cm^{-1} is attributed to the stretching vibration of C=C in the aromatic rings of quinone or keto-enol groups, showing that ether, quinone or keto-enol groups are constructed for the activated semicoke.