Supplementary Information for

Water Adsorption Dynamics into Active Carbon Probed by Terahertz Spectroscopy

Experimental details

The experimental setup was comprised of a conventional THz-TDS system with transmission geometry from the Zomega Terahertz Corporation shown in Fig. 1. The THz pulse was generated by a p-type InAs wafer with <100> orientation pumped by a Ti:sapphire laser with a center wavelength of 800 nm, a pulse width of 100 fs, and a repetition rate of 80 MHz. An appropriate thickness of sensor is necessary to the THz-TDS system because: thicker crystal can reduce the echo effect which is harm to the accuracy of the signal; thicker crystal can also give a better signal noise ratio; however, the tradeoff of a larger thickness is the bandwidth. Synthetically considering the factors above, a 2.8 mm-thick <110>ZnTe was employed as the sensor. A standard lock-in technology was used in this setup.

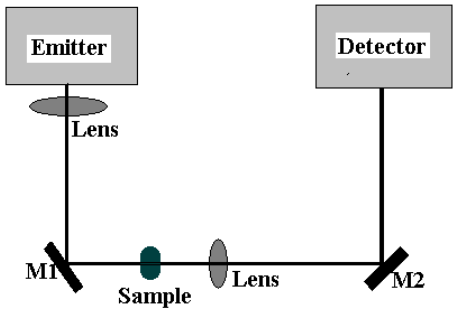

Fig. 1 THz-TDS setup

The active carbon pellets adhered tightly onto the fiber cloth to form the active carbon fiber cloth (ACFC) which was taken from the active carbon breathing mask. The active carbon was mainly composed of a carbon, hydrogen and oxygen element, and was a kind of porous material whose void radius approximately varied from ~100 nm to ~50 μm, which was confirmed by the scanning electron microscope (SEM) as shown in the Fig. 2. A single drop of water was dropped onto the middle of the ACFC. The THz pulses of the reference and the sample were measured by scanning the air and the ACFC with a water drop, respectively. This measurement was carried out over the duration of the experiments at room temperature (294.5-294.8 K) and 25.2-25.8% relative humidity (RH).

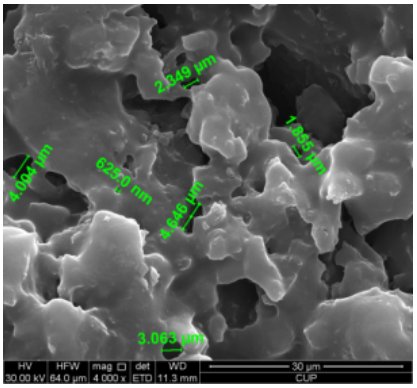

Fig. 2 SEM image of the active carbon.