Supporting Information

MATERIALS AND METHODS

Materials:

The raw kaolinite (Kaol-R) used in this study was well crystallized, obtained from Zhangjiakou, Hebei Province, China. Hydrogen chloride (HCl) solution (36 wt.%), dimethyl sulfoxide (DMSO), methanol (MeOH), and cetyltrimethyl ammonium bromide (CTAB) were in chemically pure grade and purchased from Xilong Chemical Company, China. All chemicals were used as received.

Purification of Kaol-R: 1.0 g Kaol-R was mixed with 2.0 mL 1.0 M HCl solution and stirred at 85 ℃ for 1 h. The suspension was cooled to room temperature and centrifuged. The precipitate was washed by DI water three times, dried, and referred to as Kaol-P.

Intercalation of DMSO: Kaol-P (1.0 g) was dispersed in a mixture of 1.8 g DMSO and 0.2 g distilled water. Then, the mixture was stirred for 2 h at 95 °C in an oil bath. The solid product was separated via centrifugation and dried at 60 °C for 48 h to eliminate the excessive DMSO, and the resultant intercalation compound was ground into powders and referred to as Kaol-DMSO.

Exfoliating into nanoscrolls: 1.0 g Kaol-DMSO was mixed with 10 mL $AlCl_3$/CTAB/MeOH complex solution. In this complex solution, both the concentration of $AlCl_3$ and CTAB were 1.0 M. Then, the mixture was stirred for 24 h at room temperature. The precipitate was separated via centrifugation, stored at a wet-state, and referred to as Kaol-CTAB. To investigate the effect of $AlCl_3$, a control sample without CTAB was also prepared as follows: 1.0 g Kaol-DMSO was mix with 10 mL $AlCl_3$/MeOH solution. The concentration of $AlCl_3$ was 1.0 M. The mixture was stirred for 30 min at room temperature. The precipitate was centrifuged and washed to remove the excessive $AlCl_3$. The product was died and ground into powders, referred to as Kaol-Me.

Characterization:

X-ray diffractometer (XRD) patterns were recorded using an X-ray diffractometer (XRD Rigaku D/max-2000, Japan) with Cu Kα radiation and a graphite monochromator. Dried samples of Kaol-R, Kaol-P, and Kaol-DMSO were scanned from 5-15°. Kaol-CTAB was scanned at a wet-state, and the scan range is from 1-15°. The X-ray fluorescence (XRF) characterization was conducted using a Rigaku ZSX Primus II instrument. Transmission electron microscopy (TEM) images were recorded on a 300 kV Tecnai G2 F30 S-TWIN high-resolution transmission electron microscope. Each sample was dispersed in methanol with the assistance of ultrasonication (ASONE, AS116,

20 W) for 5 min and then a drop of the dispersion was deposited onto a carbon-coated copper grid for TEM imaging.

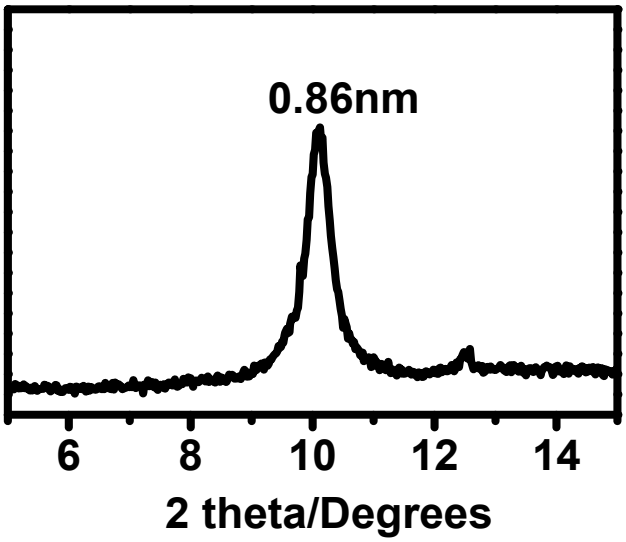

Figure1. XRD pattern of Kaol-Me.

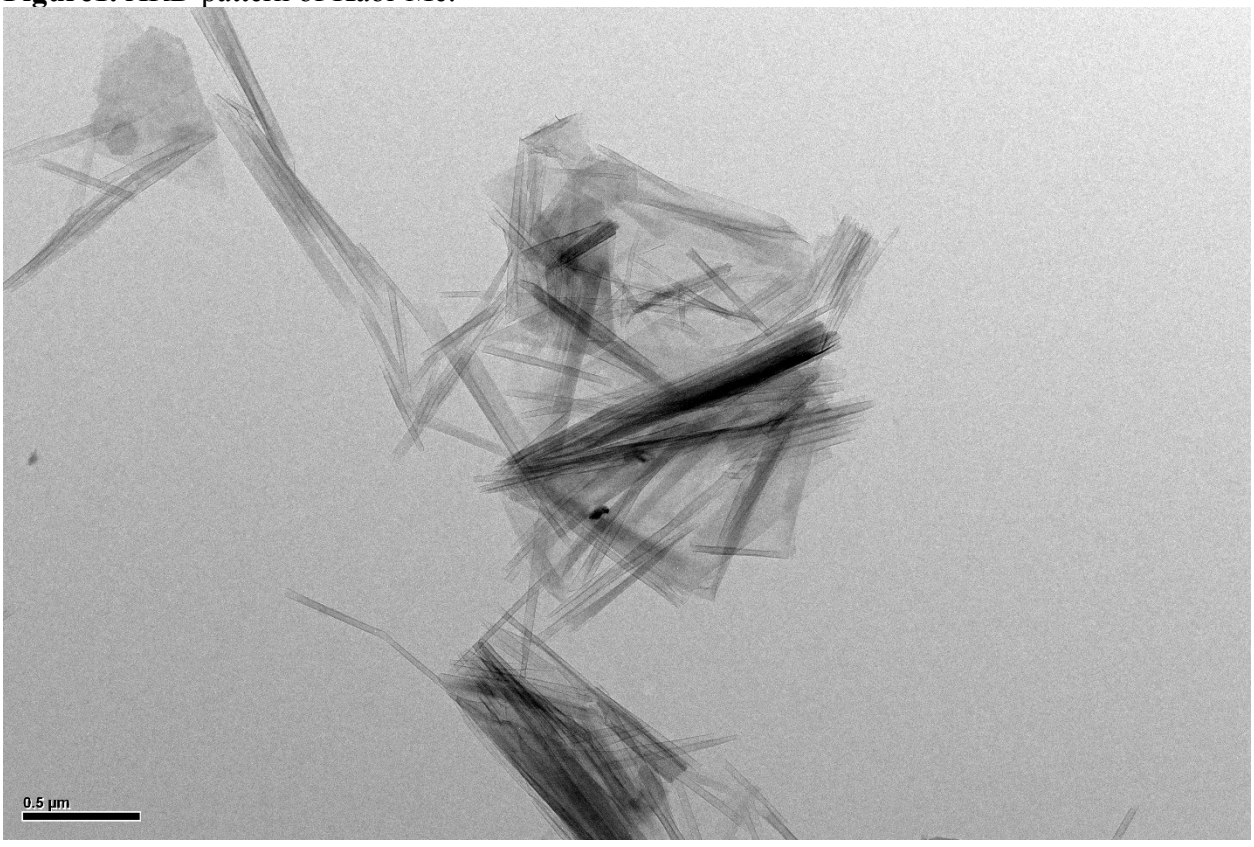

Figure 2. Low magnification TEM image of Kaol-CTAB.