Supplementary material (ESI) for Journal of Materials Chemistry
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Electronic Supplementary Information (ESI†)

Shape Deformable Nanocomposite Composed of Manganese Oxide Nanosheets

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Measurements. TG/DTA thermograms were taken on a Shimadzu DTG-60M instrument under nitrogen atmosphere (10 °C min^{-1} heating rate). FT-IR spectra were measured on KBr pellets or in dispersed KBr pellets with a Perkin-Elmer 1000 Series spectrophotometer. UV-Vis-NIR spectra were measured on quartz substrates or in dispersed KBr pellets using a Shimadzu UV-3100 spectrophotometer. EDS experiments were conducted with a JEOL JSM-5510LVN Scanning Electron Microscope operated at 20 kV. Powder XRD measurements were carried out with a MAC Science M18XHF diffractometer using Cu Kα radiation at a scanning rate of 0.01° s^{-1} in a 2θ range of 5–80°. Rheology measurements were conducted on a Thermo Scientific HAAKE MARS II rheometer at 25 °C. The moduli *G*' and *G*" were measured on frequency sweep from 10^{2} and 10^{-3} Hz under a constant strain of 0.5%, and on strain sweep from 10^{-4} to 10% at a constant frequency of 1 Hz. Ionic conductivities were measured using a Wayne Kerr impedance analyzer 6440B over the frequency range between 20 Hz and 3 MHz. The nanocomposite was filled in a conductivity cell constructed with a pair of ITO glasses (surface resistance: 10 Ω/□) as electrodes and acetate films as a spacer (cell constant: 6.0×10^{-2} cm^{-1}), and the cell was placed in a temperature (25–70 °C) and humidity (50–95% RH) controlled chamber ESPEC SH-221.

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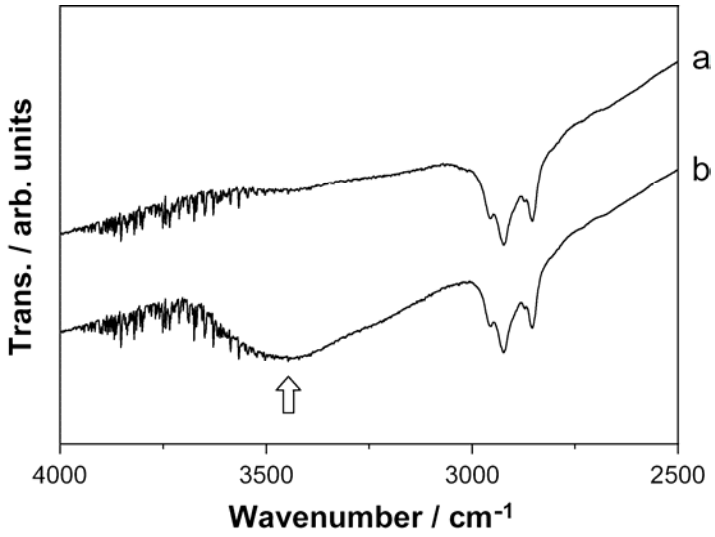

Figure S1. Infrared spectra of (a) DNC and (b) WNC coated on a KBr pellet. An arrow indicates the O–H stretching vibration of adsorbed water molecules.

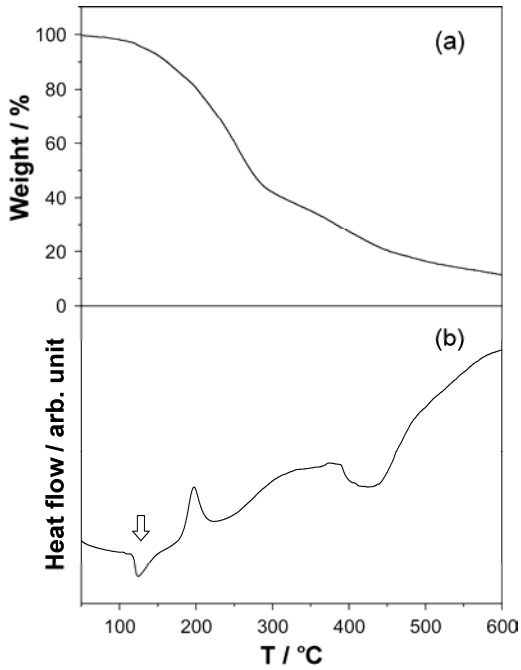

Figure S2. (a) TG and (b) DTA thermograms of WNC on heating process. An arrow indicates an endothermic peak, associated with the dehydration of the adsorbed water molecules.

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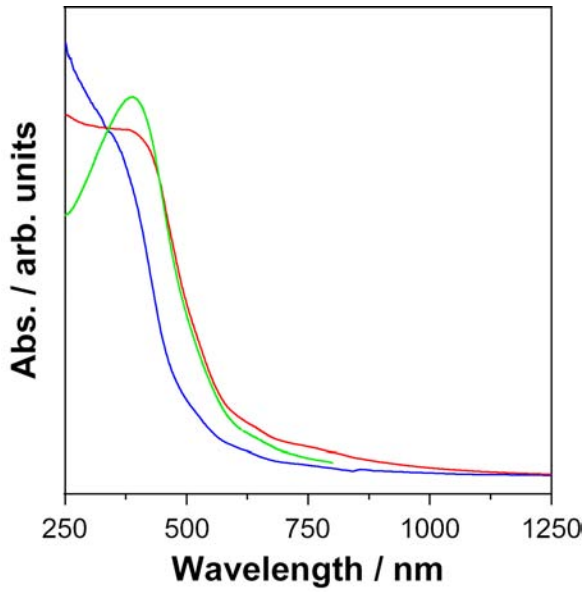

Figure S3. UV-Vis spectra of WNC mechanically coated on a quartz substrate (red line), WNC dispersed in a dispersed KBr pellet (blue line), and 10^{-4} M colloidal suspension of MnO_2 nanosheets (green line).

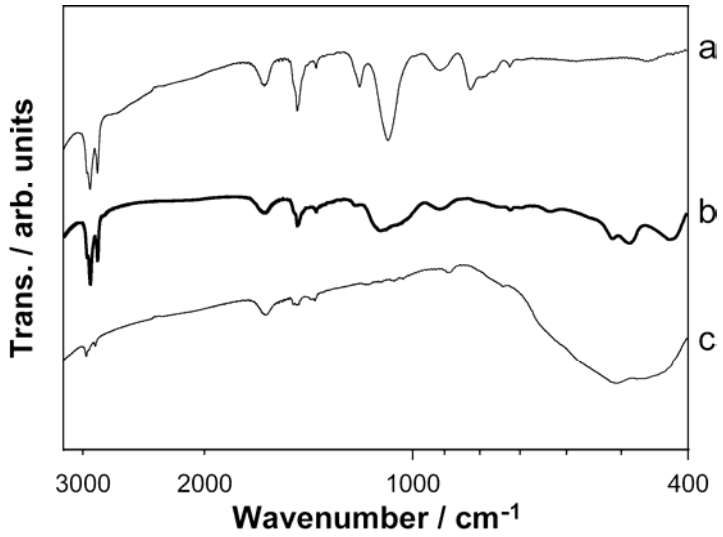

Figure S4. Infrared spectra of (a) $[(CH_3O)_3Si(CH_2)_3N(CH_3)(C_{10}H_{21})_2]Cl$, (b) WNC, and (c) tetrabutylammonium/MnO_2, dispersed in compressed KBr pellets.

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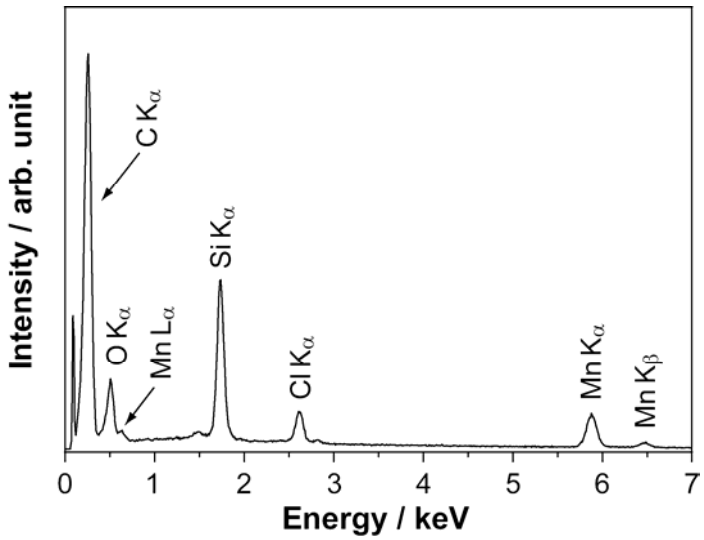

Figure S5. EDS spectrum of DNC.

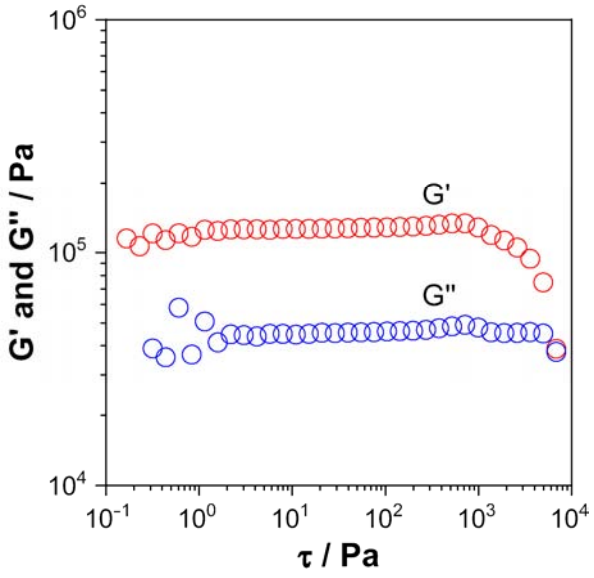

Figure S6. Stress dependences of dynamic storage (*G*', red circles) and shear-loss (*G*", blue circles) moduli of WNC at a constant frequency of 1 Hz at 25 °C.

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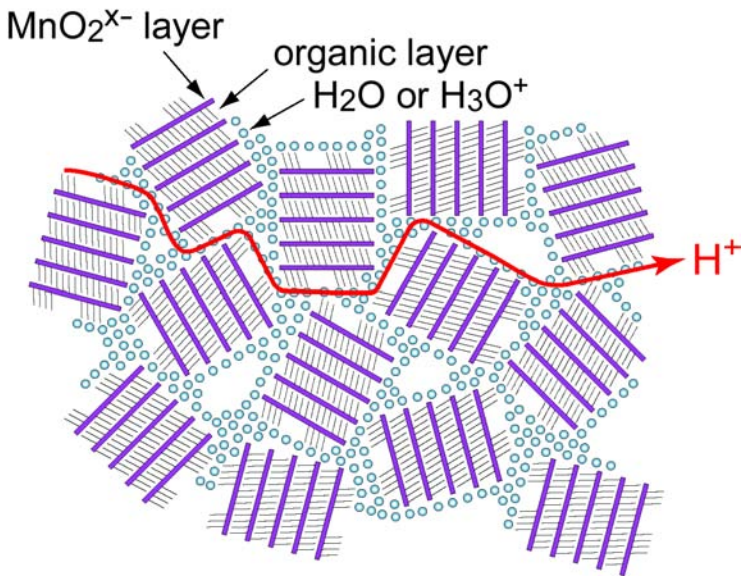

Figure S7. Schematic model of proton conduction for WMC.