Electronic Supplementary Information (ESI)

Synthesis of nano-$Li_4Ti_5O_{12}$ decorated on non-oxidized carbon nanotubes with enhanced rate capability for lithium-ion batteries

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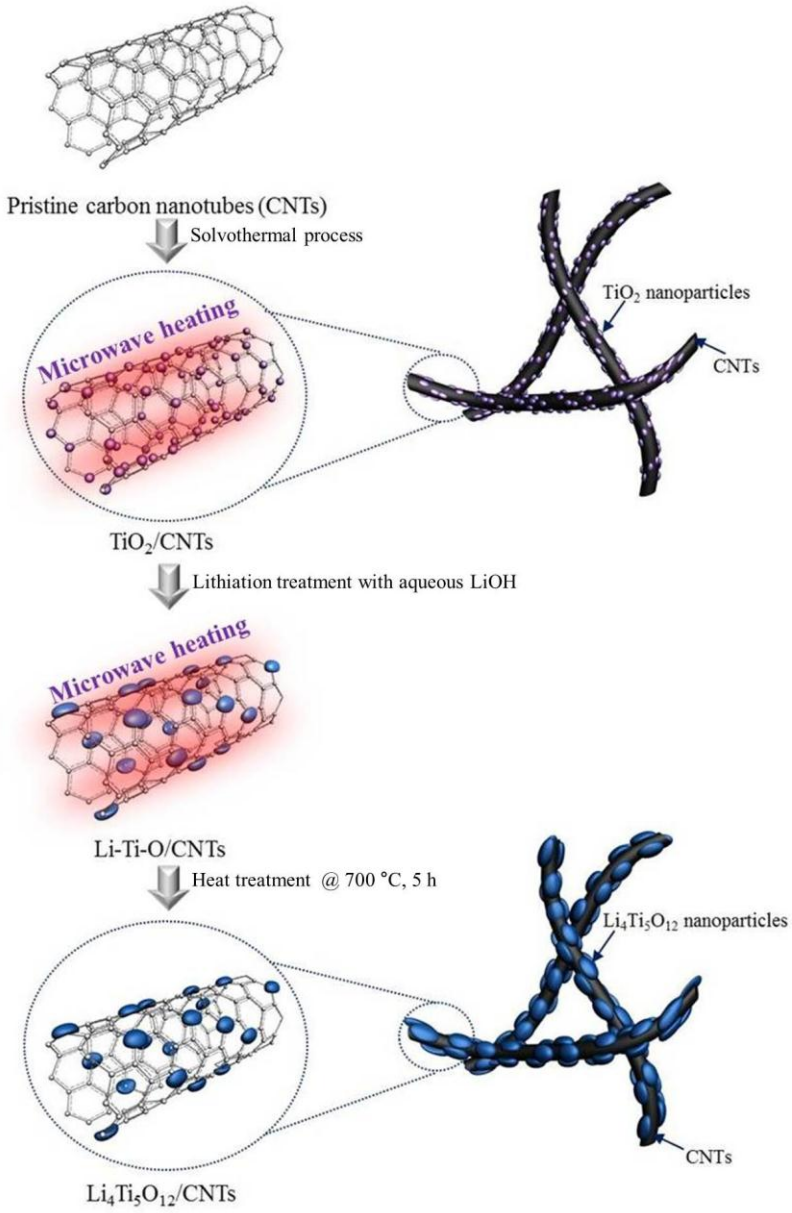

Figure S1. Schematic illustration of the protocol adopted for the synthesis of nano-$Li_4Ti_5O_{12}$ decorated on non-oxidized CNTs.

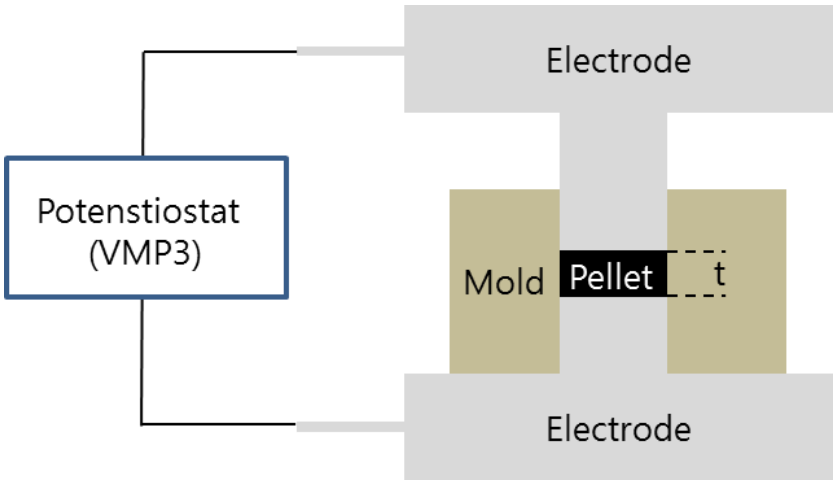

Figure S2. Schematic diagram of the cell used for measuring the electrical conductivity of the samples by using the two-point probe method. The cell was assembled with a stainless-steel top electrode and a fixed bottom electrode, poly(methyl methacrylate) (PMMA) mould, and $Li_4Ti_5O_{12}$/CNTs nanocomposite electrode in the form of a pelletized disc of area 1.33 cm^2.

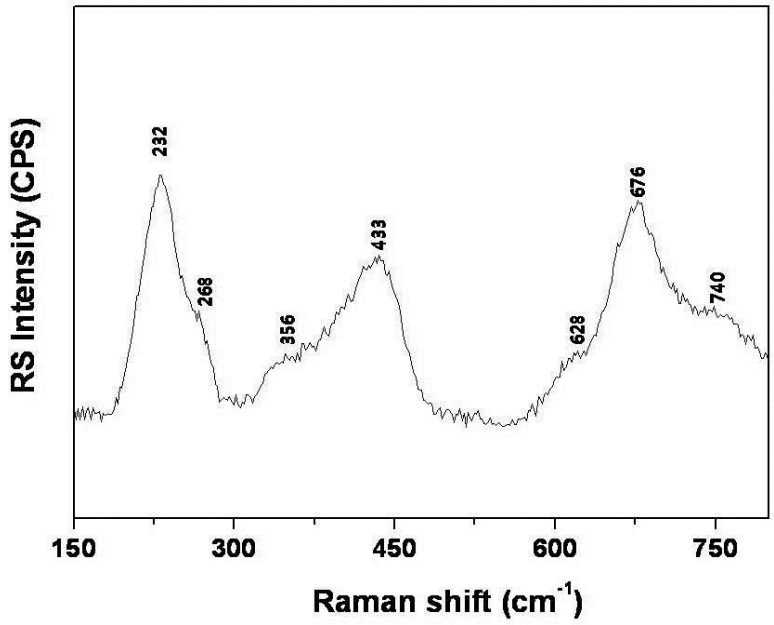

Figure S3. Raman spectrum of $Li_4Ti_5O_{12}$ in $Li_4Ti_5O_{12}$/CNTs nanocomposite. Seven vibrational peaks were observed at 233, 268, 356, 433, 628, 676, and 740 cm^{-1}. These Raman-allowed phonon peaks are the fingerprints of the spinel structure (A1g+Eg+3F2g+F1u+F2u), which confirm the formation of phase-pure spinel $Li_4Ti_5O_{12}$ in the nanocomposite.

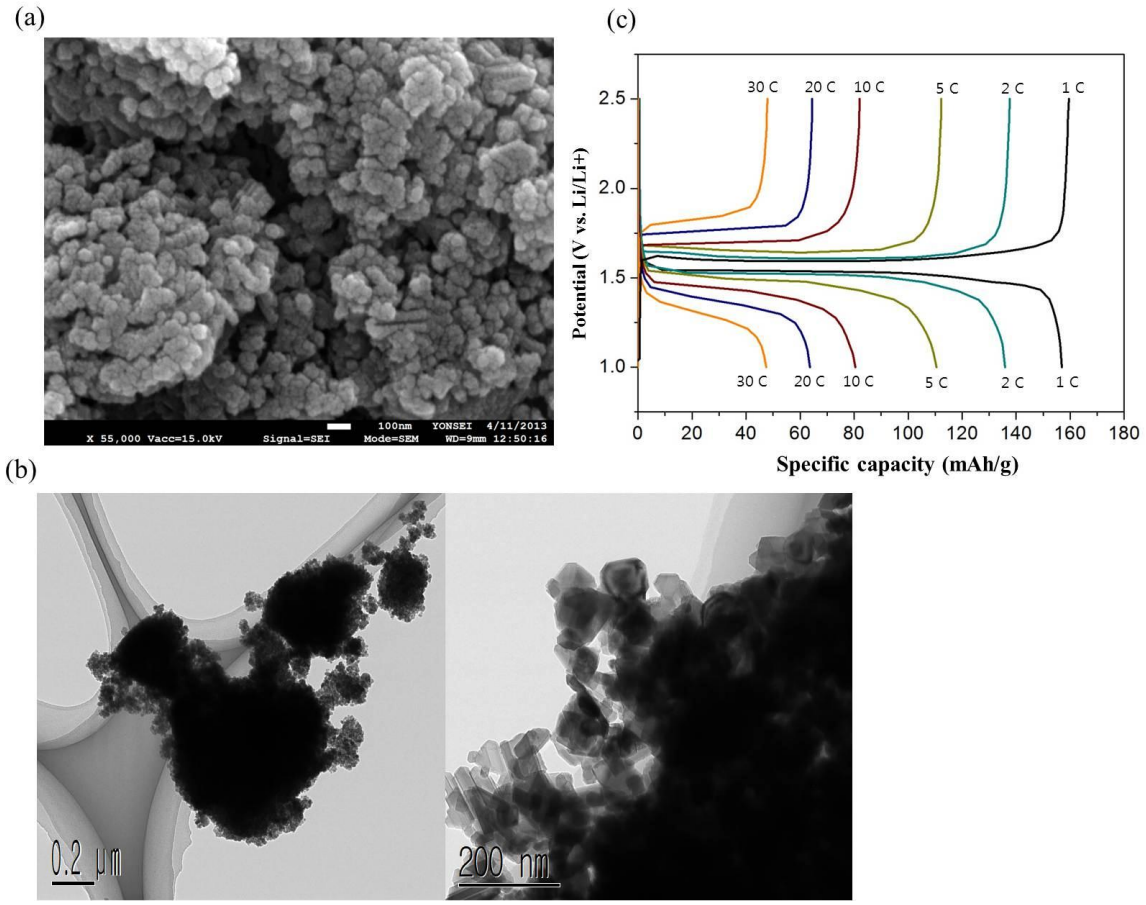

Figure S4. (a) SEM and (b) TEM images of the $Li_4Ti_5O_{12}$ nanoparticles prepared by the microwave-solvothermal method in the absence of CNTs. The resulting $Li_4Ti_5O_{12}$ nanoparticles (size < 50 nm) were agglomerated because of the absence of the CNT matrix. (c) The second charge-discharge curves of $Li_4Ti_5O_{12}$ nanoparticles prepared in the absence of CNTs. Rate capability of $Li_4Ti_5O_{12}$ nanoparticles (mixed with 15 wt% CNT) under different current rates (from right to left): 1, 2, 5, 10, 20, and 30 C-rate.

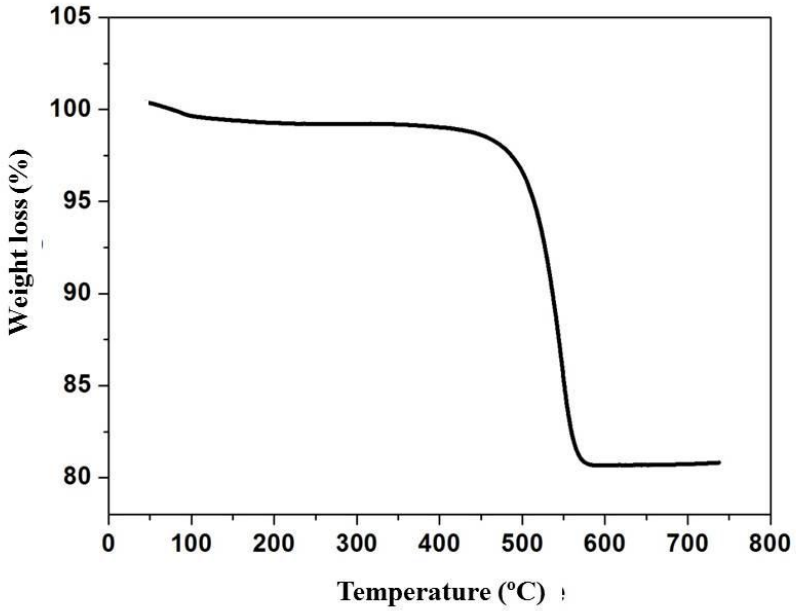

Figure S5. Thermogravimetric analysis (TGA) of $Li_4Ti_5O_{12}$/CNT nanocomposite. From the thermogravimetric data, the loading amount of $Li_4Ti_5O_{12}$ in the $Li_4Ti_5O_{12}$/CNTs nanocomposite was evaluated to be 80 wt%.

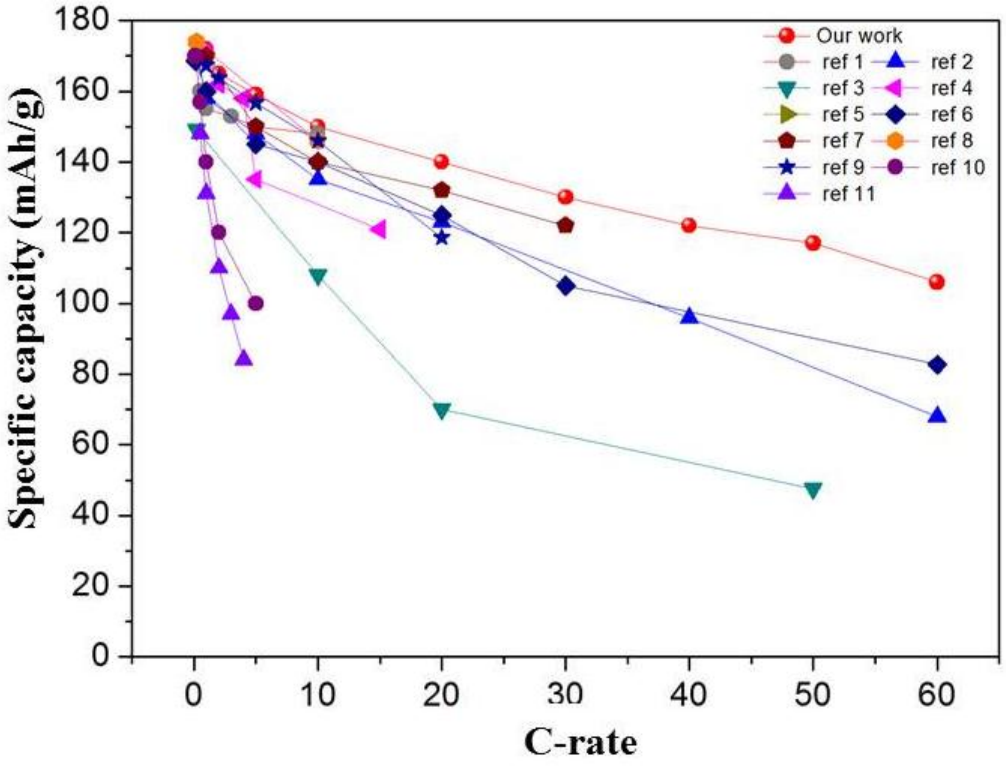

Figure S6. Comparison of rate capabilities (discharge capacity versus discharge rate) of the $Li_4Ti_5O_{12}$/CNT nanocomposite prepared in this study with that of the reported $Li_4Ti_5O_{12}$/CNT composite (refs.1, 2, 3, 4) and $Li_4Ti_5O_{12}$/graphene composite (refs. 5, 6, 7, 8, 9, 10, 11).

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