Electronic Supplementary Information

XPS Data Comparison and In Situ IR Spectra

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Experimental

PEGME-SnO_2 powder was fixed on double-sided tapes to obtain the X-ray photoelectron spectra (XPS) on a VG ESCA–LAB MK II X-ray photoelectron spectrometer, using Mg–Kα radiation under 10^{-7} Pa. The C_{1s} signal was used to correct the charge effects on the sample surface. On a Nicolet Impact 410 FTIR spectrometer, the in situ IR spectra of the PEGME-SnO_2 doped PEO–$LiClO_4$ films were measured in vacuum through a cell with CaF_2 windows.

Results and Discussion

Figure S1 lists the XPS results of the freshly prepared SnO_2 nanoparticles and PEGME-SnO_2 nanocomposites. The freshly precipitated SnO_2 nanoparticles adsorb a lot of Cl^- anions on their surfaces, about 13.6 % atom percent according to peak area integration. The data for PEGME-SnO_2 nanocomposites are different: no Cl element signals are detected and Sn atom signals are much weaker than that of SnO_2 due to PEGME group shielding effects (exhibiting strong C_{1s} signals). Therefore, it can be inferred that PEGME groups have replaced the Cl^- anions adsorbed on SnO_2 surface after exchange reactions.

Figure S2 displays the in situ IR spectra of the PEGME-SnO_2 doped PEO–$LiClO_4$ film, indicating that no water or solvents exist in the composite SPE films after evacuation. Although a trace amount of solvents or water can greatly enhance the film conductivities, these impurities will corrode lithium electrodes and cause safety problems as far as the application in lithium batteries is concerned.

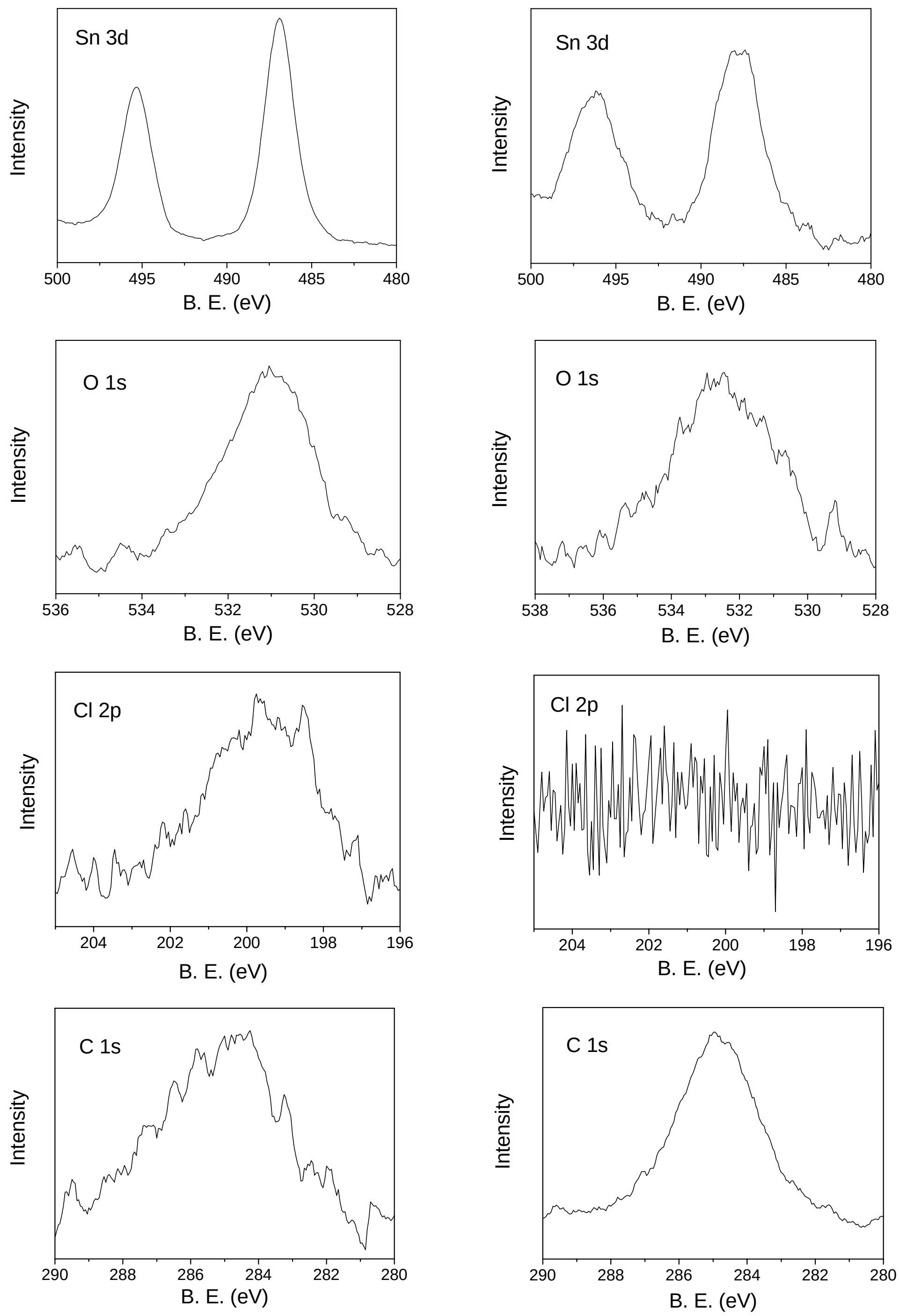

Figure S1. XPS results of the freshly prepared SnO_2 nanoparticles (left) and the PEGME-SnO_2 nanocomposites (right). It should be noted that since the deposited carbon from pump oil is used as the internal reference, both samples shows C_{1s} signals.

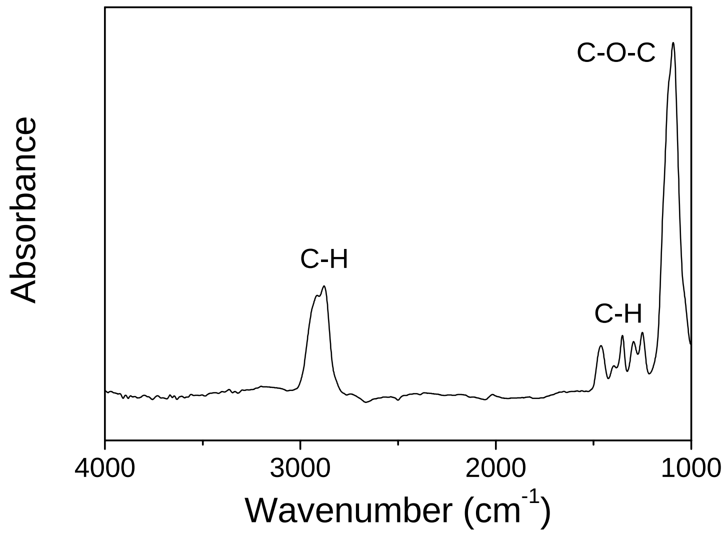

Figure S2. In situ IR spectra of the PEGME-SnO_2 (10 wt. %) doped PEO–$LiClO_4$ ([EO]/[Li] = 10) film, evident for absence of water and solvents.