

Supporting Information for

High sodium ionic conductivity in PEO/PVP solid polymer electrolytes with InAs nanowire fillers

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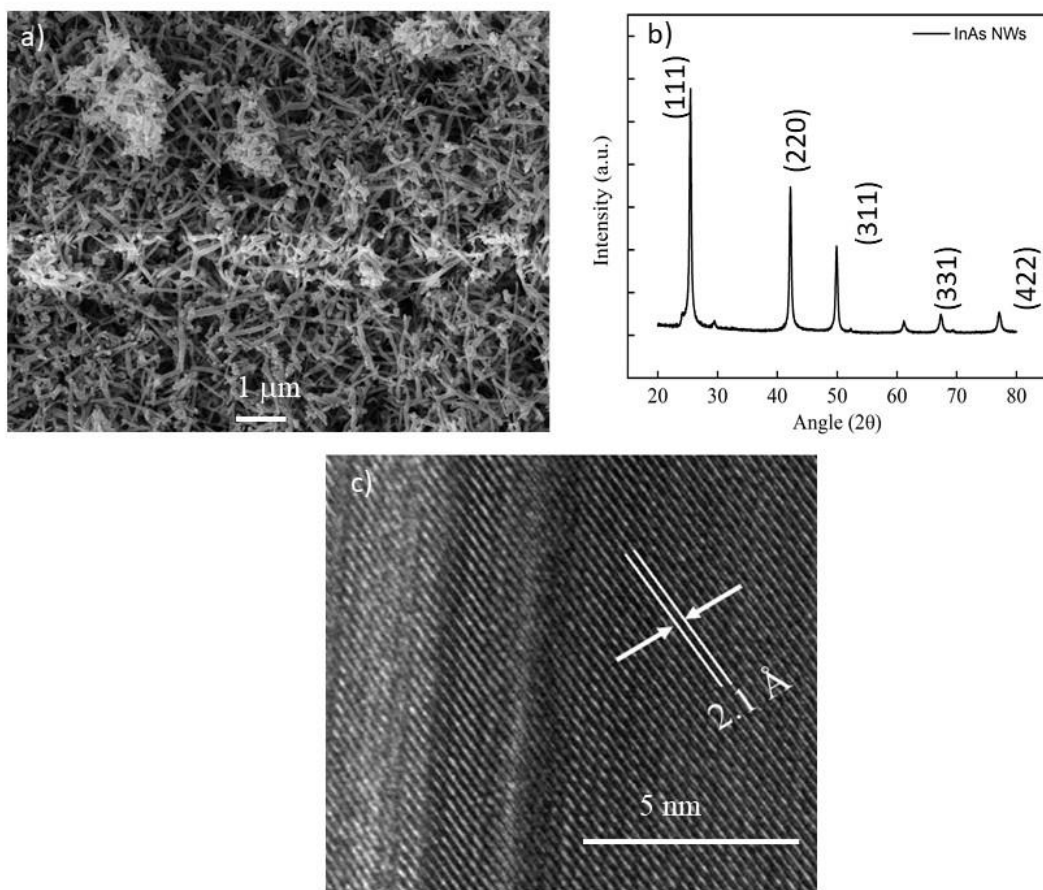


Figure S1: (a) FESEM image of a network of InAs NWs synthesized by a solvothermal method. (b) XRD spectrum of an ensemble of synthesized InAs NWs. (c). HRTEM image of a single InAs NW showing the stacking faults.

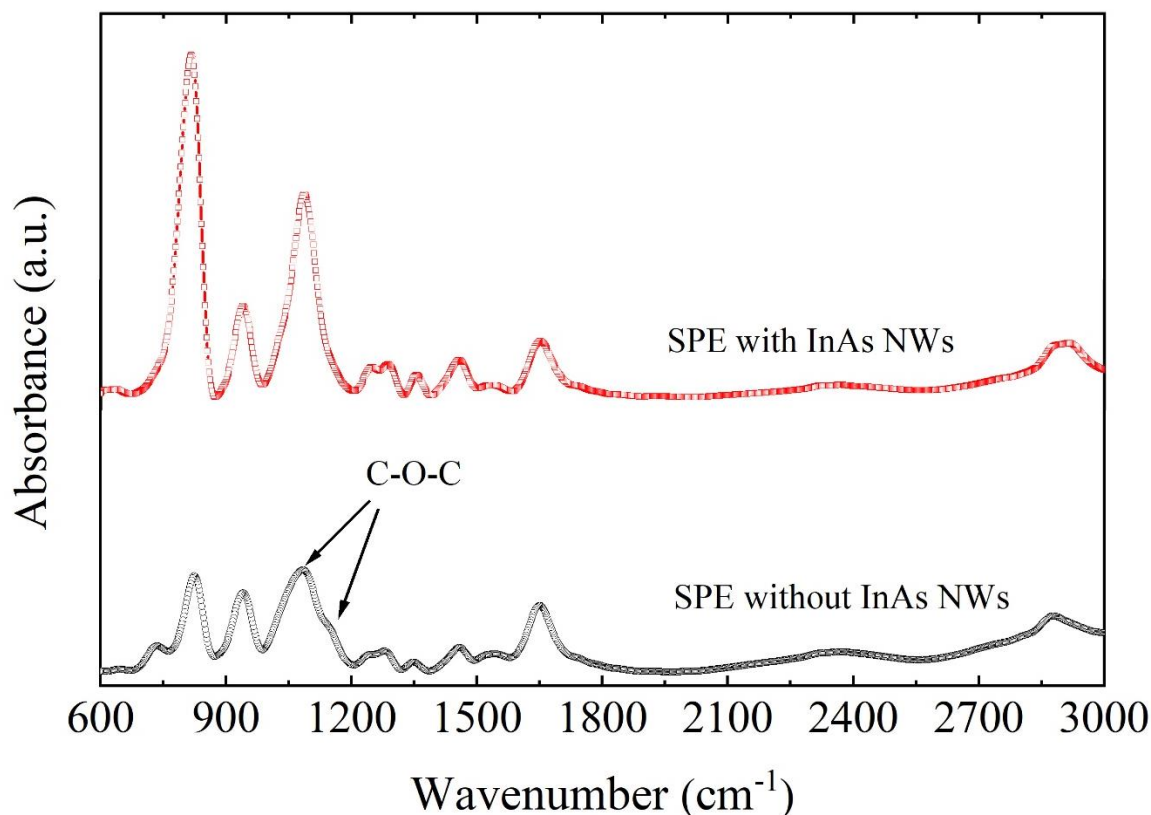


Figure S2: Absorbance spectrum of a PEO-PVP-NaPF₆ SPE without NWs (black curve) and with 1 wt% InAs NWs (red curve), respectively.

Figure S2 shows absorbance spectra of PEO-PVP-NaPF₆ SPEs with and without InAs NWs. The spectra show the main characteristic peaks of PEO and PVP in the SPE¹. The spectra show characteristic absorbance peaks at $\sim 1085\text{ cm}^{-1}$ and $\sim 1140\text{ cm}^{-1}$ related to the symmetric and antisymmetric C-O-C stretching modes of PEO¹, respectively. The incorporation of InAs NWs results in an enhanced (reduced) absorbance for the symmetric (antisymmetric) mode, indicating an interaction between Na⁺ and the ether group of PEO. The peak at $\sim 820\text{ cm}^{-1}$ is attributed to vibration modes related to anions (PF₆⁻). The fraction of free PF₆⁻ and contact ion pairs (Na⁺-PF₆⁻)

can be calculated from the area of the deconvoluted peaks shown in Figure S3. The peak area ratio of free PF_6^- to contact ion pairs ($\text{Na}^+ - \text{PF}_6^-$) increases for the SPE with InAs NWs, which indicates that the degree of dissociation enhances.

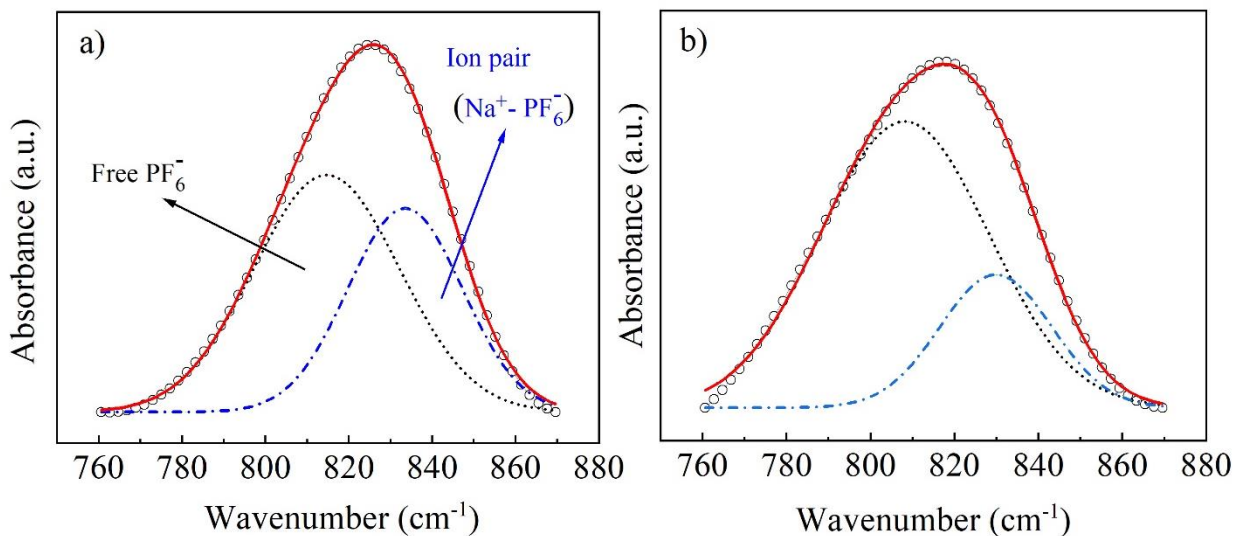


Figure S3: Gaussian-Lorentzian fittings of the free PF_6^- and ($\text{Na}^+ - \text{PF}_6^-$) ion pair absorbance of PEO-PVP-NaPF₆ SPEs without a) and with b) 1 wt% InAs NWs, respectively. The red traces are fittings to the experimental data (black circles).

Reference:

1. Arya, A. & Sharma, A. L. Optimization of salt concentration and explanation of two peak percolation in blend solid polymer nanocomposite films. *J. Solid State Electrochem.* **22**, 2725–2745 (2018).