Core-Shell $Fe_{1-x}S@Na_{2.9}PS_{3.95}Se_{0.05}$ Nanorods for Room Temperature All-Solid-State Sodium Batteries with High Energy Density

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Supporting Figures

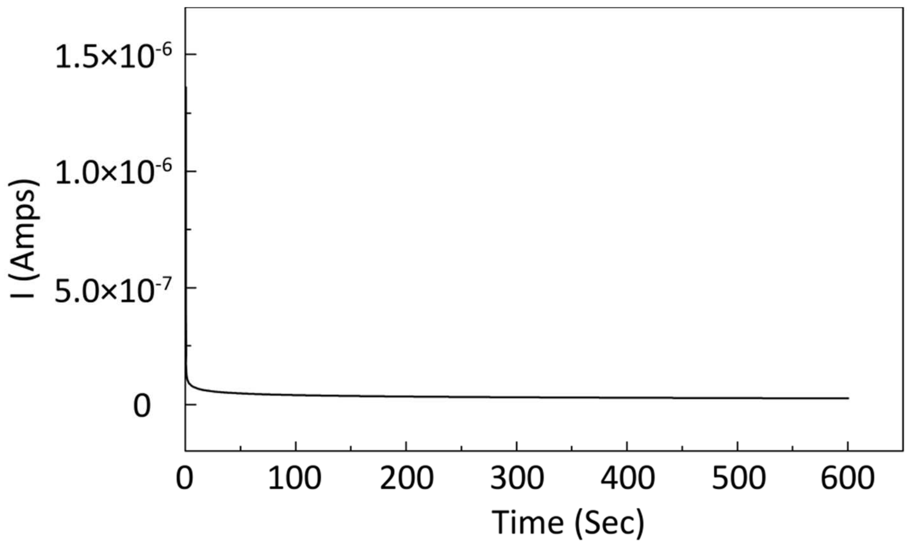

Figure S1. Direct current (DC) polarization curves for $Na_{2.9}PS_{3.95}Se_{0.05}$ electrolyte.

The electronic conductivity (σ_e, S cm^{-1}) is determined by the following equation: $\sigma_e = L/(R \times S)$, where L (~ 0.1 cm) is the thickness of electrolyte, S (0.785 cm^2) is the area of the electrode, R (Ω) is related to the applied polarization voltage (0.1 V) and the delivered constant current (I). The constant current determined by DC polarization is 3.08×10^{-8}A. The calculated electronic conductivity of $Na_{2.9}PS_{3.95}Se_{0.05}$ electrolyte is 3.9×10^{-8} S cm^{-1}. Hence, Na^+ transference number is 0.9997 determined by $t_{Na+} = \sigma_i / \sigma = \sigma_i / (\sigma_e + \sigma_i)$, where $\sigma_e = 3.9 \times 10^{-8}$ S cm^{-1}, $\sigma = 1.21 \times 10^{-4}$ S cm^{-1}.

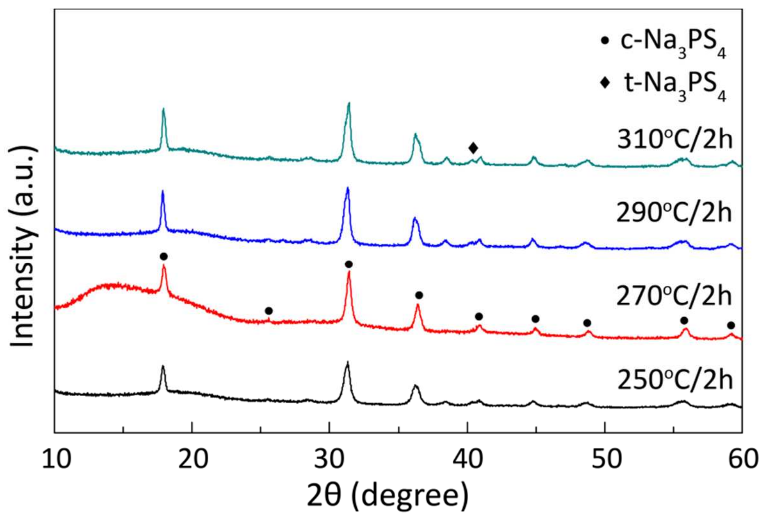

Figure S2. XRD patterns of $Na_{2.9}PS_{3.95}Se_{0.05}$ samples under different annealing temperatures.

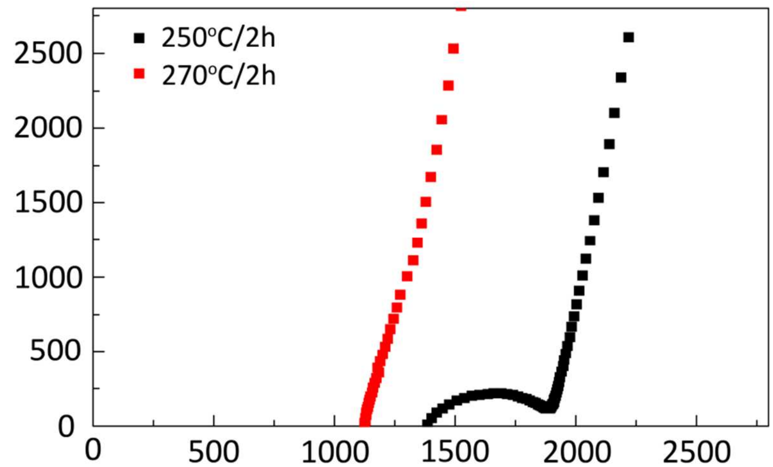

Figure S3. Impedance of $Na_{2.9}PS_{3.95}Se_{0.05}$ samples under different annealing temperatures.

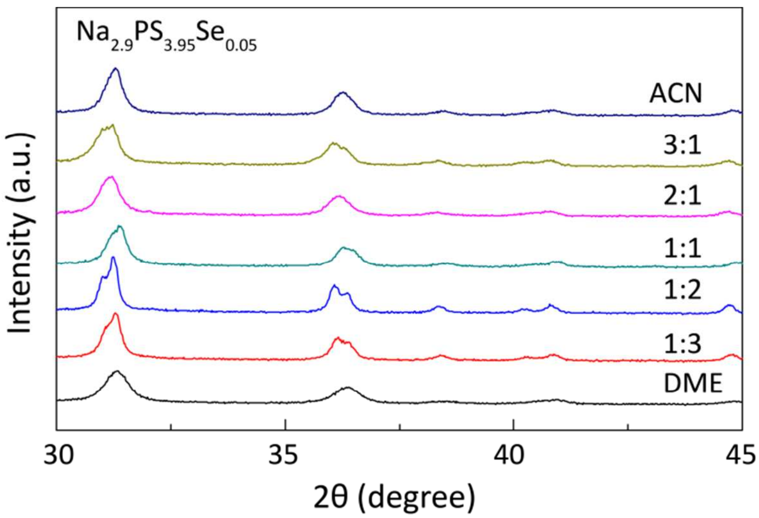

Figure S4. Powder X-ray diffraction patterns of $Na_{2.9}PS_{3.95}Se_{0.05}$ samples using acetonitrile, 1, 2-dimethoxyethane and their mixed solvents (acetonitrile/1, 2-dimethoxyethane, volume ratio = 3:1, 2:1, 1:1, 1:2, 1:3).

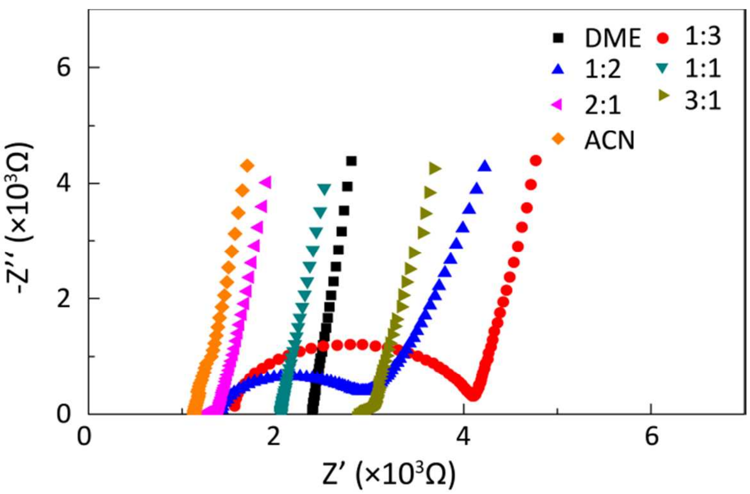

Figure S5. Impedance spectra of $Na_{2.9}PS_{3.95}Se_{0.05}$ samples using acetonitrile, 1, 2-dimethoxyethane and their mixed solvents (acetonitrile/1, 2-dimethoxyethane, volume ratio = 3:1, 2:1, 1:1, 1:2, 1:3).

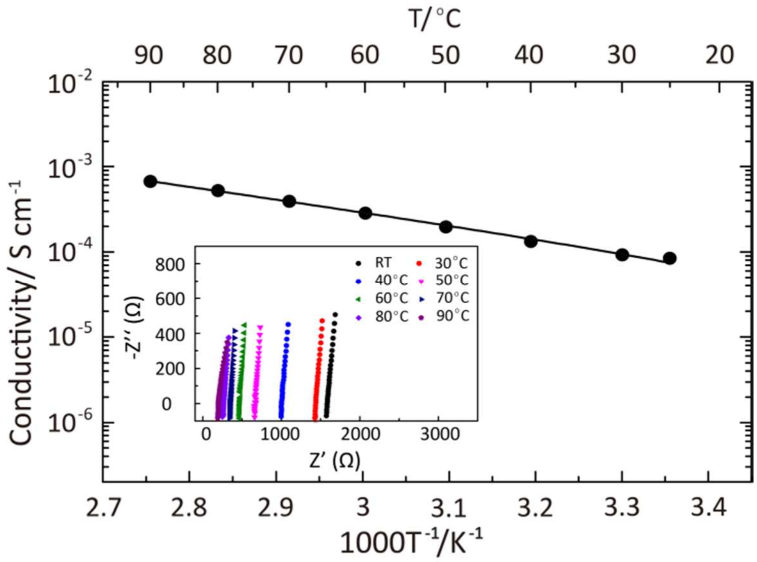

Figure S6. Temperature dependences of the ionic conductivities for Na_3PS_4 (the inset is impedance spectra of the Na_3PS_4 sample under different temperatures).

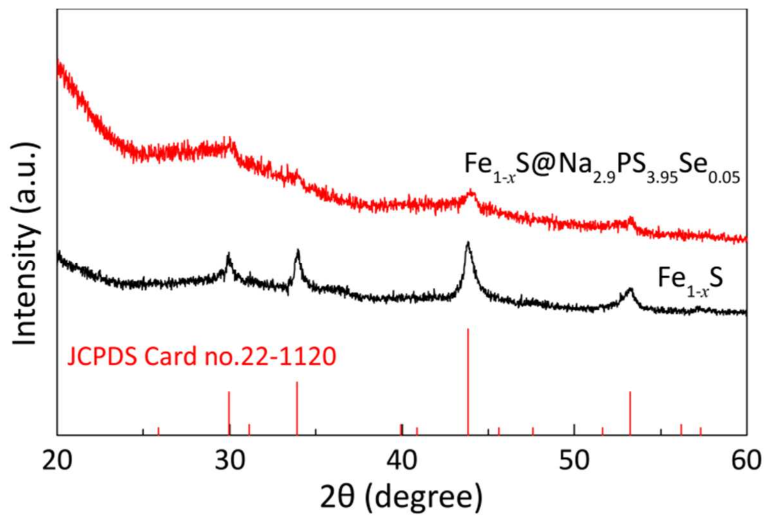

Figure S7. XRD patterns of $Fe_{1-x}S$ and $Fe_{1-x}S@Na_{2.9}PS_{3.95}Se_{0.05}$.

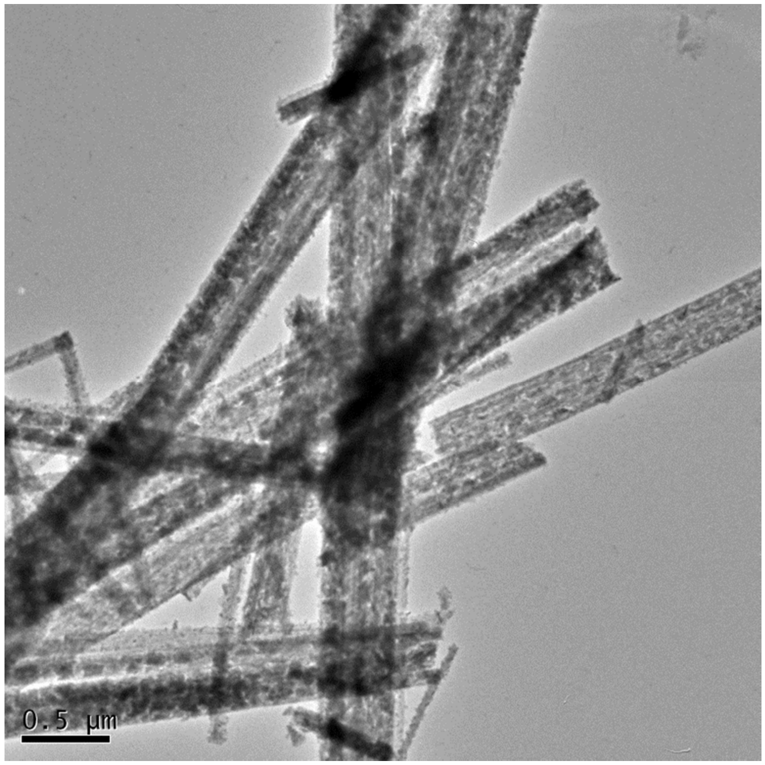

Figure S8. A TEM image of $Fe_{1-x}S$ nanorods.