

Supporting information

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1. Electrode fabrication of SiNPs-CMC-Super P and SiNPs-PVDF-Super P anodes.

The SiNPs-CMC-Super P and SiNPs-PVDF-Super P anodes were made by slurry process, in which 70 mg SiNPs was mixed with 20 mg Super P (Timcal) and 10 mg CMC or PVDF (Sigma Aldrich). After stirring two hours, the slurry was bladed on a copper foil current collector, dried in air two hours and placed in vacuum oven 80°C overnight. After this process, those films was pressed severe times and cut to suitable size for half-cell. The total mass of electrodes was typically 0.3~0.4 mg cm⁻². The composition of electrode was approximately about 70% silicon, 20% conductive additive and 10% binder. Moreover, the assembling of half-cell was practiced in argon box with CR2032-type coin cells with Celgard 2400 separator. The lithium metal foil served as a counter, and the composition of electrolyte was 1M LiPF₆ dissolved in the mixture of 44% ethylene carbonate (EC), 44% diethyl carbonate (DEC), 10% fluorinated ethylene carbonate (FEC) and 2% vinylene carbonate.

| | PANi/Cl | PANi/SPA | PANi |
|-----------------------------------|---------|----------|--------------------|
| Conductivity(S cm ⁻¹) | 2.08 | 6.67 | 5x10 ⁻⁵ |

Table S1. Conductivity of PANi doped with chloride ion and SPA compared to pure PANi.



Figure S1. The photograph of silicon nanoparticles powder.

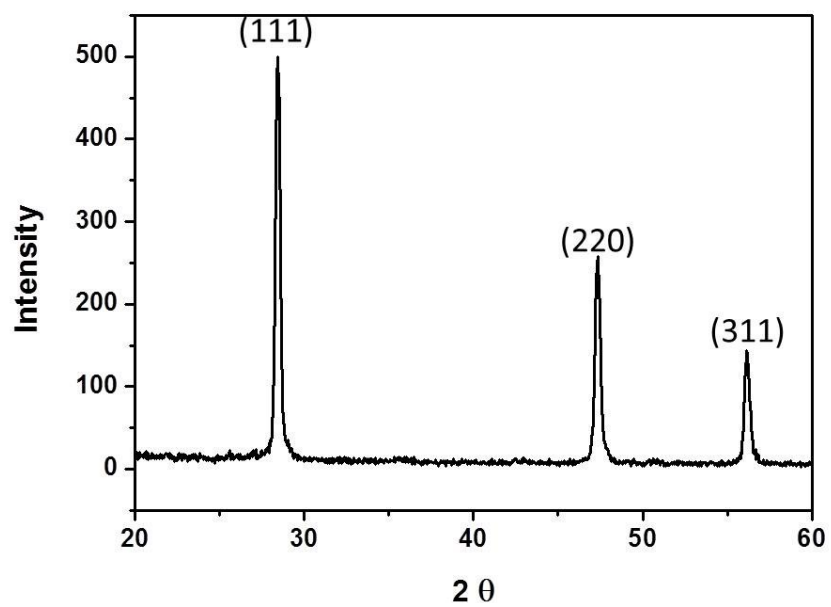


Figure S2. XRD spectrum of silicon nanoparticles.

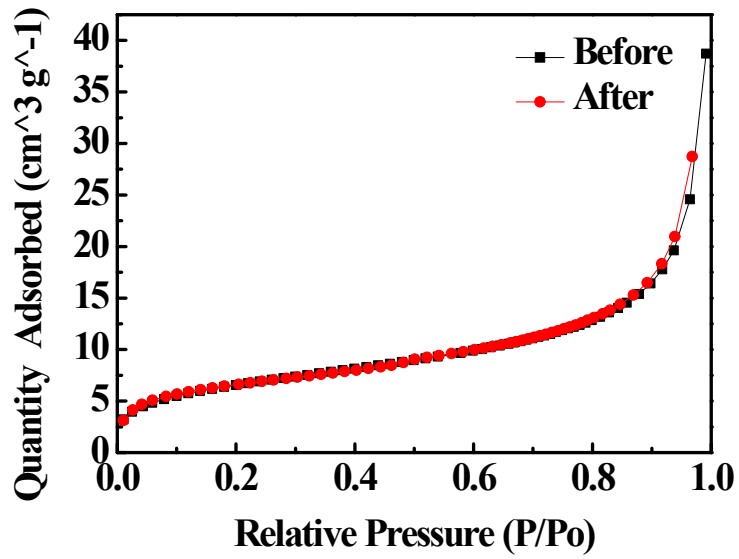


Figure S3. Nitrogen adsorption/desorption isotherms of silicon nanoparticles

The size of Si NPs were determined by following equation

$$a_v = \frac{\pi D_p^2}{\rho_p \left(\frac{\pi}{6} D_p^3 \right)} = \frac{6}{\rho_p D_p}$$

$$a_v \text{ (BET surface area)} = 23.9613 \text{ m}^2/\text{g}$$

$$\rho_p \text{ (Density)} = 2.329 \text{ g/cm}^3$$

$$D_p \text{ (diameter)} = 107.5 \text{ nm}$$

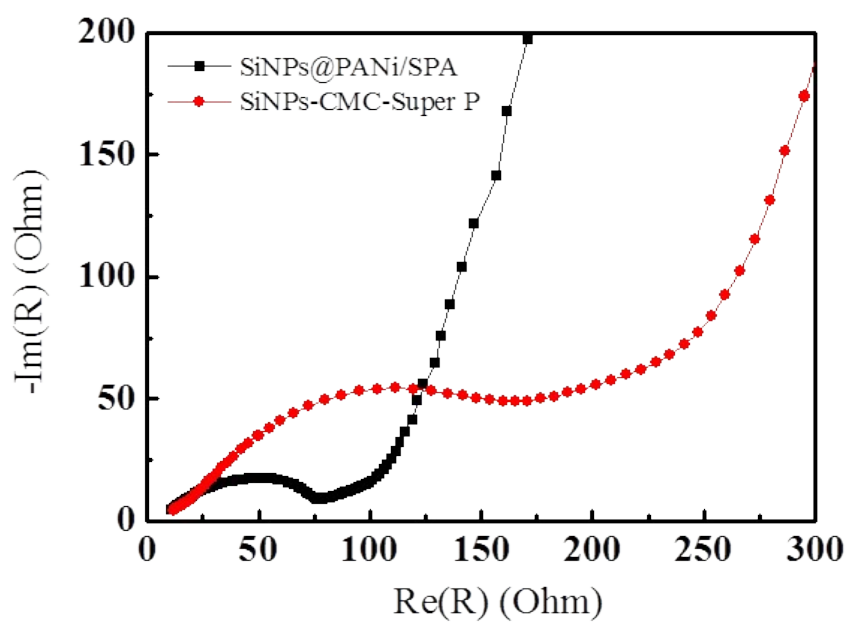


Figure S4. EIS spectrum showed that SiNPs@PANi/SPA was compared with SiNPs-CMC-Super P

| 500cycles | SPA-PANi | CMC-Super P |
|-----------|----------------|-----------------|
| R_{CT} | 77.87 Ω | 211.47 Ω |

Table S2. The resistance of SiNPs@PANi/SPA and SiNPs-CMC-Super P are exhibited.