Supporting Information

Processing Nanoparticle-Nanocarbon Composites as Binder-Free Electrodes for Lithium-Based Batteries

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This supporting information file contains: 3 pages, 1 figure, 1 table, and the preparation method for Pt counter electrodes.

TABLE S1: Comparison of binder-free electrode processing and traditional slurry processing for nano-carbons.

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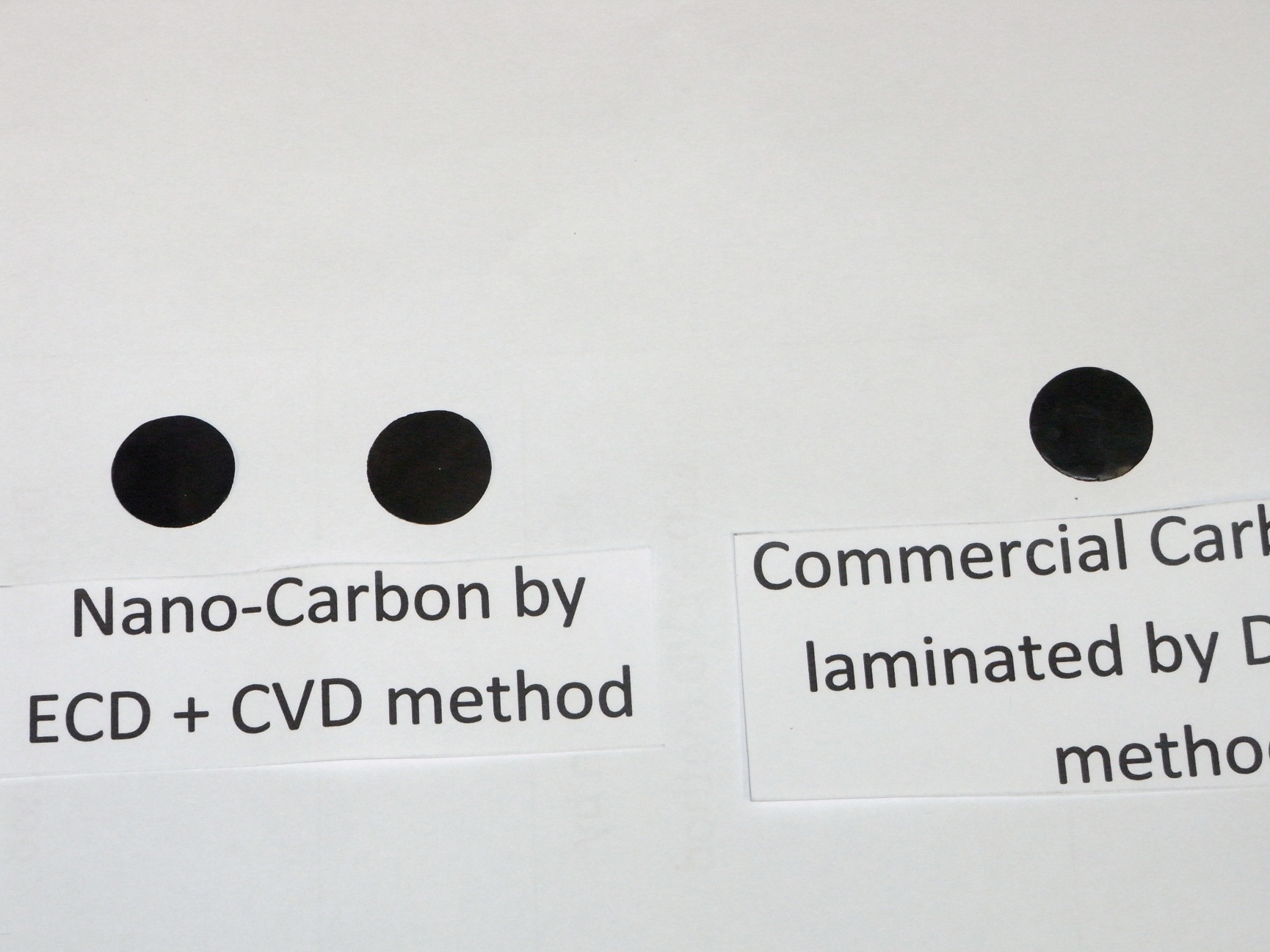
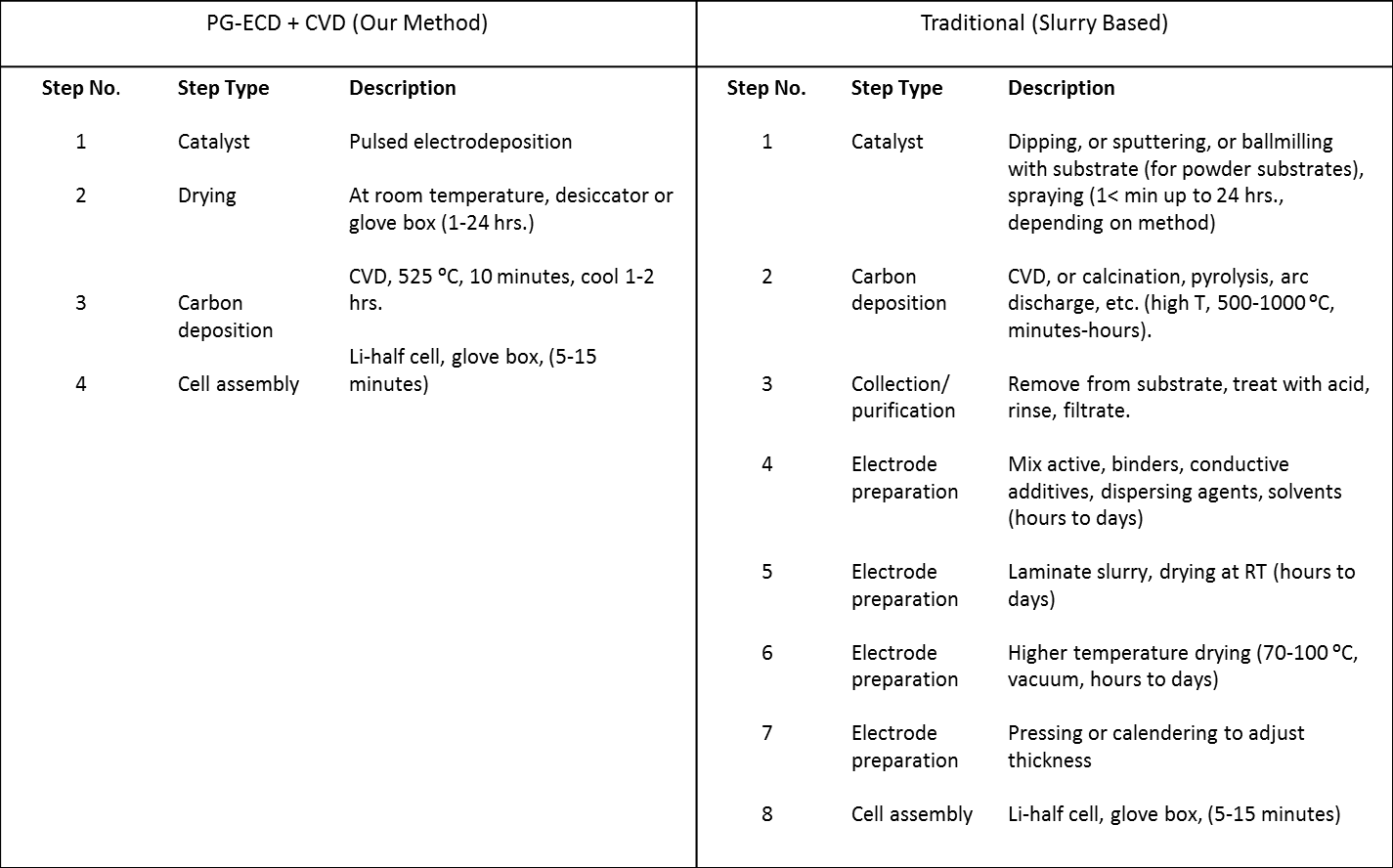


Figure S2: Photograph of Fe-nanocarbon electrodes obtained by out method (left) and commercial amorphous carbon by traditional slurry method (right). A good carbon coverage of the electrode is observed in the Fe-C electrodes as well as the traditional preparation.

**Methods for preparing Pt counter electrodes:**

Pt deposition on glass.

The clean glass slides (microscope slides) with size of 76x26x1mm3 were used as substrates for Pt deposition. In this work we have done deposition by means of D.C. magnetron sputtering in a magnetron sputtering system Classic 500SP (Pfeiffer Vacuum). The system features five magnetrons thus facilitating co-deposition of several materials without braking vacuum in the growth chamber. A platinum target (99.95%) from Ted Pella was used as a deposition source. For better adhesion the Ti adhesion layer of 25nm thickness was grown on the glass prior depositing platinum. A Ti target (99.95%) from Kurt J. Lesker was used. The thickness of the Pt film was 50nm. Thickness of the deposited films was estimated by measuring thickness of the “witness” film grown on a piece of masked Si wafer placed next to the glass substrate during metal film deposition. A piece of narrow Si bar (~3 mm x10 mm) cut out from the Si wafer was used as a growth mask clamped down to the silicon substrate. The depth of the trough created on the Si wafer upon metal deposition was measured with the help of a stylus profiler DektakXT (Bruker). The precision of the described above method for film thickness measurements of films thicker than 10nm was better than 20%. The substrate was kept at room temperature during deposition. The composition of the film was checked ex-situ by means of X-ray photoelectron spectroscopy using an UHV spectrometer described elsewhere. 1 The XPS spectra confirmed formation of virtually pure platinum layer. Detected traces of carbon and oxygen in the spectra of the sample as grown can be related to the surface contamination due to exposure the sample to the ambient before being introduced into the XPS chamber for analysis. No signature of Ti was observed thus proving continues character of the Pt deposit.

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1. Bondarchuk, O.; Morel, A.; Bélanger, D.; Goikolea, E.; Brousse, T.; Mysyk, R., Thin films of pure vanadium nitride: Evidence for anomalous non-faradaic capacitance. *Journal of Power Sources* **2016,** 324, 439-446.

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