## Supplementary Information:

# Nickel-Salen Type Polymer as Conducting Agent and Binder for Carbon-Free Cathodes in Lithium-Ion Batteries

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# 1. CV profile of a poly[Ni($CH_3$-Salen)]

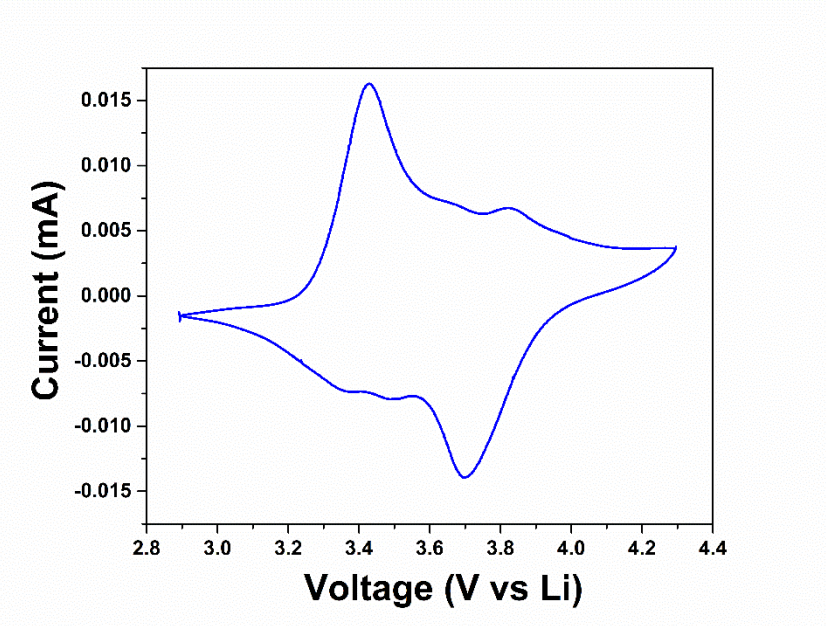


**Figure S1.** Representative CV profile of poly[Ni($CH_3$-Salen)] measured by using a scan rate of 10 mV/s in a voltage range of 2.9 – 4.3 V at room temperature.

Figure S1 shows a representative CV profile of the poly[Ni($CH_3$-Salen)] prepared by a polymerization of [Ni($CH_3$-Salen)] on electron-conducting electrodes. Most of the redox occurs within the voltage range of conventional Li-ion battery cathode materials, including $LiFePO_4$ used in this study. The details of redox mechanism have been recently reported by Dmitrieva et al.[1]

(1) Dmitrieva, E.; Rosenkranz, M.; Danilova, J. S.; Smirnova, E. A.; Karushev, M. P.; Chepurnaya, I. A.; Timonov, A. M. Electrochimica Acta 2018, 283, 1742–1752.

## 2. Full-cell performance of a poly[Ni($CH_3$-Salen)]

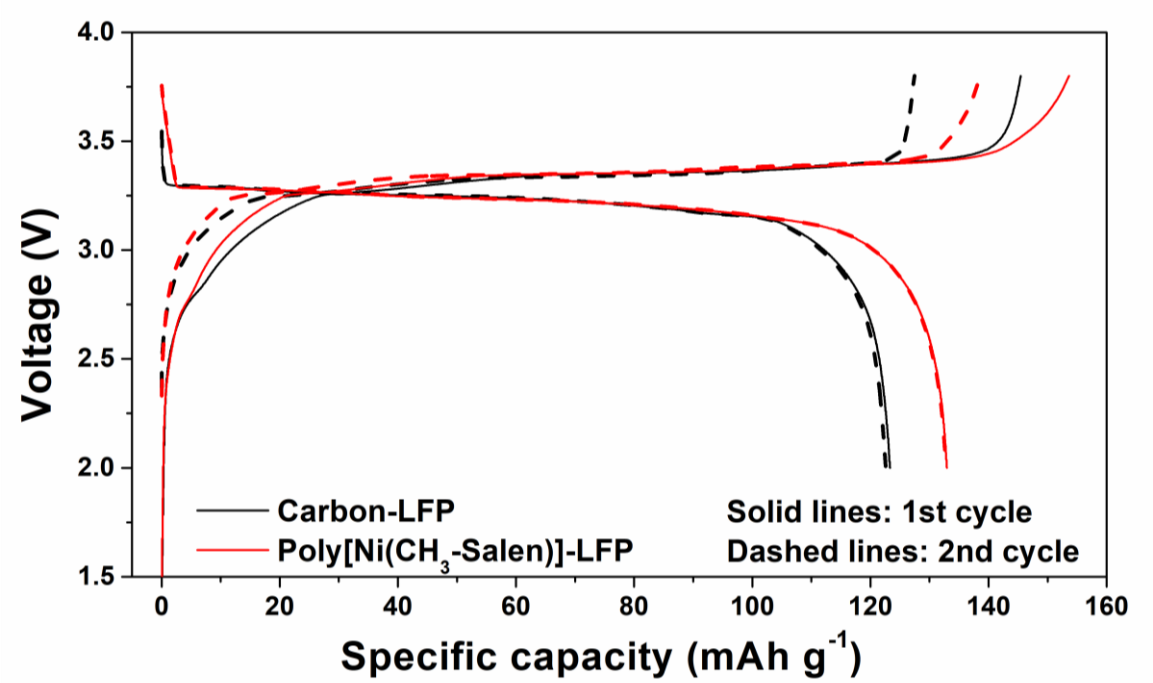


**Figure S2.** Charge-discharge profiles of full-cells prepared by paring Poly[Ni($CH_3$-Salen)]-LFP or Carbon-LFP cathodes with graphite anodes. The specific capacity values are determined based on the masses of the entire cathodes (but excluding Al-foil).

Figure S2 plots two first consecutive C/10-rate charge-discharge cycles for full cells with Poly[Ni($CH_3$-Salen)]-LFP and Carbon-LFP electrodes. The formation of SEI on the graphite can clearly be observed during 1$^{st}$ charge (at around 2.8 V full-cell voltage). The 2$^{nd}$ cycle discharge-capacities are, respectively, 132.8 mAh/g for Poly[Ni($CH_3$-Salen)]-LFP and 123.3 mAh/g for Carbon-LFP. The capacity improvement due to the polymer has been also observed, as seen from the half cells (using Li-metal anodes).