**The Electrode Microstructure Engineering for stable swelling behavior of graphite anodes for Li-ion batteries**

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**Highlights**

* The uniform porosity distribution improve the electrochemical properties
* Two-step pressing process shows good cycling performances as Li-ion batteries.

**1. Introduction**

To increase the energy density of conventional Li-ion batteries (LIBs), the graphite anode becomes thicker. However, the severe swelling problem of graphite electrodes associated with the high active material mass loading leads to the degradation of electrochemical properties and safety issues. Here, we report the two-step pressed graphite anodes for the swelling control of the high energy density graphite anodes. The electrode prepared by the two-step pressing process significantly reduces swelling behavior with the improved electrode microstructure. Through two-step roll pressing process, the uniform porosity distribution in the graphite electrode could improve the physicochemical and electrochemical properties such as electrolyte wettability, rate retention and capacity retention through the efficient stress relaxation applied to the graphite anodes.

**2. Methods**

For slurry preparation of graphite, CMC binder (1wt%) solution, SBR (40%) were placed into deionized water in a weight ratio of 97.8 : 1.0 : 1.2. The slurry was mixed at 3000RPM for 10 min. and coated onto cu current collector using doctor blade, and dried at 100 oC, for 5min.

**3. Results and discussion**

The full cell with exhibits improved cycling performance compared to the full cell with 100-0%, 75-100% electrode. The microstructure engineering enhanced efficient relaxation of stress applied to the graphite anode during cycle.



**Figure 1.** Cycling performance of pouch full cell (LCO/graphite) with different pressing processes.

**4. Conclusions**

In terms of simplicity, our electrode design has a potential to be applied to the practical use for the stable swelling behavior as well as the enhanced cycle performance in LIBs. The electrode produced by the two-step pressing process significantly reduces swelling behavior. By using two-step pressing process, the uniform porosity distribution in the electrode improve the electrochemical properties such as electrolyte wettability, rate retention and capacity retention.