

Improvement of Rate Performance of LiFePO₄ Cathode with Porous LiFePO₄/Activated Carbon Hybrid Electrode Structure

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In order to improve the rate performance of cathodes in lithium ion battery (LIB), LiFePO₄ (LFP)/activated carbon (AC) hybrid cathode was developed. After preparing LFP and AC layers on each face of an aluminum current collector, through-holes with the pore diameter of 22 μm and opening rate of 0.5 % were formed on the electrode with pico-second pulsed laser. A half cell was fabricated with the electrode and two lithium (Li) metal electrodes. The half-cell exhibited much improvement of rate performance (Fig. 1). Because the LFP/AC electrode having no through holes and LFP electrode did not exhibit the improvement, it was considered that energy and Li⁺ transfer occurred between LFP and AC layers, and Li⁺ passed through the holes from AC to LFP.

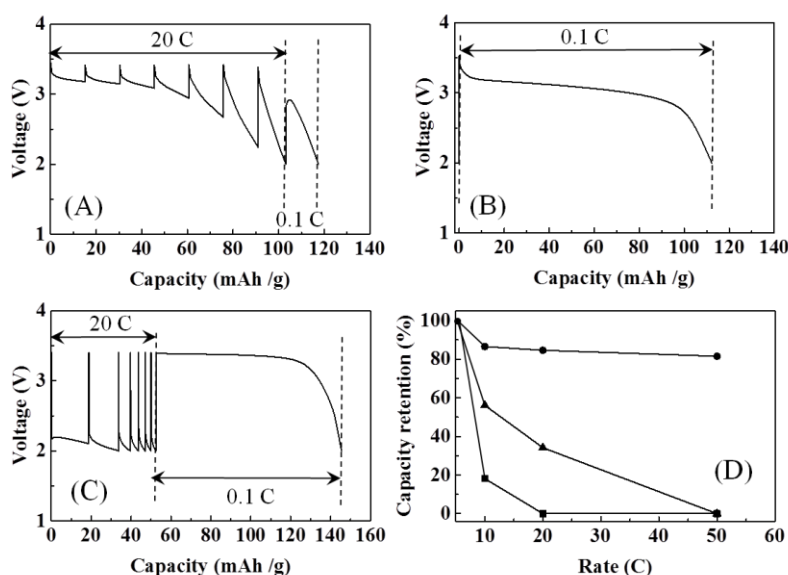


Fig. 1 Discharge curves of LFP/AC electrodes with 0.5 (A) and 0 % (B) of the opening rate of hole and 22 μm of average hole diameter, and LFP electrode (C) at 20 C, where the discharge of 20 mAhg^{-1} was repeated by 7 times and then the cells were finally discharged at 0.1 C, and the open circuit time (5 min) was inserted between discharge processes. (D) Total discharge capacity observed after 7 times-discharge/open circuit processes vs. the discharge rate. ●: LFP/AC electrode with 0.5 % of the opening rate, ▲: LFP/AC electrode with 0 % of the opening rate, ■: LFP electrode.