$Na_2FeP_2O_7$ cathode material for aqueous sodium-ion batteries

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Sodium-ion batteries have raised interest as a low cost alternative to lihium-ion batteries. In order to further reduce costs and introduce new technologies that would be safer and more environmentally friendly, batteries in which the electrolyte is water-based are being researched. Although the energy density of these batteries are not the highest, for many applications cost efficient and abundant batteries can be useful, especially for grid level energy storage.

Many materials which are promising for organic sodium-ion batteries are not stable in water. $Na_2FeP_2O_7$ is one of the few sodium insertion materials, which shows very good stability in aqueous media. In this work $Na_2FeP_2O_7$, which has been previously studied in non-aqueous electrolytes[1-3], has been studied in Na_2SO_4 electrolyte, in half-cells and symmetrical cells. Gravimetric capacity >80 mAh/g can be observed for half-cells. By optimizing the battery cell architecture as well as the preparation of the electrode, electrochemical performance of $Na_2FeP_2O_7$ for aqueous sodium-ion batteries was improved. In symmetrical cells $Na_2FeP_2O_7$ reaches gravimetric capacity of 60 mAh/g and the cyclability results are stable without any significant drop after 100 cycles (Figure 1).

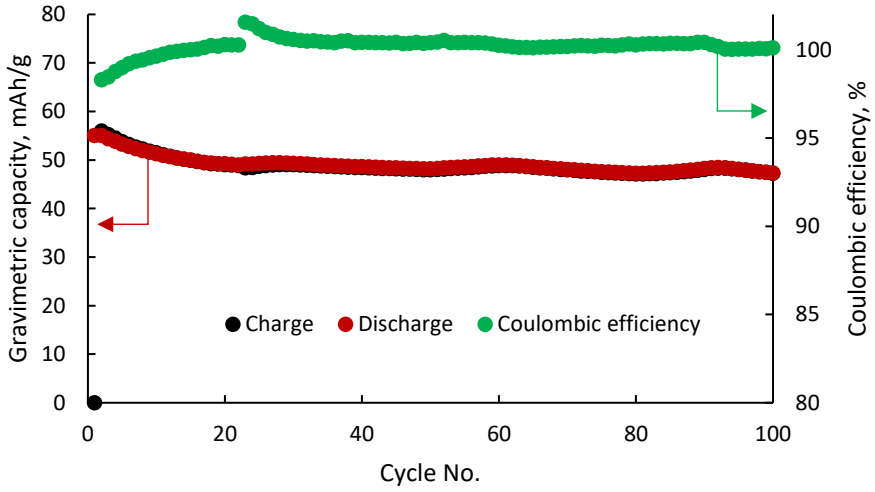

Figure 1: Gravimetric capacity obtained from symmetrical $Na_2FeP_2O_7$ battery cell

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