

Electrochemical characteristics of  $\text{LiMn}_{0.8}\text{Fe}_{0.2}\text{PO}_4$  cathode with polyacrylonitrile (PAN) based gel polymer electrolyte

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Electrochemical properties of  $\text{LiMn}_{0.8}\text{Fe}_{0.2}\text{PO}_4$  cathode were investigated with gel polymer electrolyte (GPE). To access fast and efficient transport of ions and electrons during the charge/discharge process, a pure and well-crystallized  $\text{LiMn}_{0.8}\text{Fe}_{0.2}\text{PO}_4$  cathode material was directly synthesized via spray-pyrolysis method. For high operation voltage, polyacrylonitrile (PAN)-based gel polymer electrolyte was then prepared by electrospinning process. The gel polymer electrolyte showed high ionic conductivity of  $2.9 \times 10^{-3} \text{ S cm}^{-1}$  at 25 °C and good electrochemical stability. Li/GEP/  $\text{LiMn}_{0.8}\text{Fe}_{0.2}\text{PO}_4$  cell delivered a discharge capacity of 159 mAh g<sup>-1</sup> at 0.1 C rate that was close to the theoretical value (170 mAh g<sup>-1</sup>). The cell allows stable cycle performance (99.3% capacity retention) with discharge capacity of 133.5 mAh g<sup>-1</sup> for over 300 cycles at 1 C rate and exhibits high rate-capability. PAN-based gel polymer is a suitable electrolyte for application in  $\text{LiMn}_{0.8}\text{Fe}_{0.2}\text{PO}_4/\text{Li}$  batteries with perspective in high energy density and safety.