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Structural and electrochemical study of lithium iron (II) pyrophosphate

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Lithium iron(II) pyrophosphate, Li₂FeP₂O₇, attracts attention of researchers for application as a cathode material in rechargeable lithium batteries. Li₂FeP₂O₇ has somewhat higher voltage than commercial LiFePO₄ (3.5 and 3.4 V, respectively), thus enables higher energy density, and also provides the possibility of two-electron reaction during intercalation. Within this study, pristine Li₂FeP₂O₇ and its composite with carbon Li₂FeP₂O₇/C were synthesized, with the carbon being formed by the pyrolysis of organic precursor in situ during formation of Li₂FeP₂O₇ at high temperature. The polymer of methylcellulose was used as carbon source because of its ability to reversibly, depending on temperature, dissolve or gel in water. The structural, electrical and electrochemical characteristics of prepared powders were investigated by means of X-ray diffraction analysis, Mössbauer spectroscopy, impedance spectroscopy and galvanostatic charge/discharge testing. The results imply that in situ formation of carbon alters lattice parameters, decreases crystallite size, and facilitates lithium ion intercalation/deintercalation processes.

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