리튬이온전지에서 새로운 양극재료를 위한 금속인산화물
Lithium Transition Metal Phosphate Cathodes for Advanced Lithium Batteries

정성윤, Yet-Ming Chiang*
인하대학교 재료공학부, *Massachusetts Institute of Technology
(sychung@inha.ac.kr)

Lithium storage electrodes for rechargeable batteries require mixed electronic-ionic conduction at the particle scale in order to deliver desired energy density and power density characteristics at the device level. Recently, lithium transition metal phosphates of olivine and Nasicon structure type have become of great interest as storage cathodes for rechargeable lithium batteries due to their high energy density, low raw materials cost, environmental friendliness, and safety. However, the transport properties of this family of compounds, and especially the electronic conductivity, have not generally been adequate for practical applications. Recent work in the model olivine $LiFePO_4$, showed that control of cation stoichiometry and aliovalent doping results in electronic conductivity exceeding 10^{-2} S/cm, in contrast to ~10^{-9} S/cm for high purity undoped $LiFePO_4$. The increase in conductivity combined with particle size refinement upon doping allows current rates of >6 A/g to be utilized while retaining a majority of the ion storage capacity. These properties are of much practical interest for high power applications such as hybrid electric vehicles. The defect mechanism controlling electronic conductivity, and understanding of the microscopic mechanism of lithiation and delithiation obtained from combined electrochemical and microanalytical techniques, will be discussed