The Doping Effects on the Properties of $LiFePO_4$ by Aliovalent Cations

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$LiFe_{1-x}M_xPO_4$ ($0.01 \le x \le 0.1$, M=Ti, Al) powders were prepared via a solution method, the XRD patterns were observed with the beam lines of 01C of the National Synchrotron Radiation Research Center of Taiwan, shown in Fig. 1 and Fig. 2.

The electrochemical properties as cathode material for lithium batteries of the prepared powders were determined by capacity retention study. As shown in Fig. 3 to 5 , $LiFe_{0.95}Al_{0.05}PO_4$ and $LiFe_{0.97}Ti_{0.03}PO_4$ [1] show the most promising cycling performance and rate capability among the prepared samples, respectively. It might be attributed to these samples have higher Li^+ diffusivity than others. That can be manifested that have higher lattice constant.

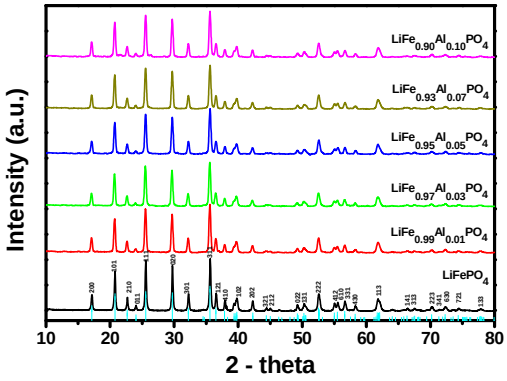

Fig. 1: XRD patterns of the $LiFe_{1-x}Al_xPO_4$ samples prepared by solution method with heat treatment 700°C for 8 h under N_2 flowing atmosphere.

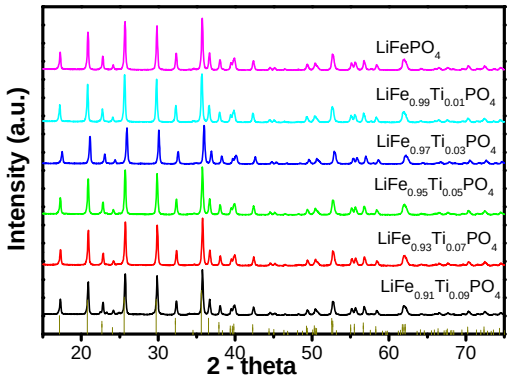

Fig. 2: XRD patterns of the $LiFe_{1-x}Ti_xPO_4$ samples prepared by solution method with heat treatment 700°C for 8 h under N_2 flowing atmosphere.

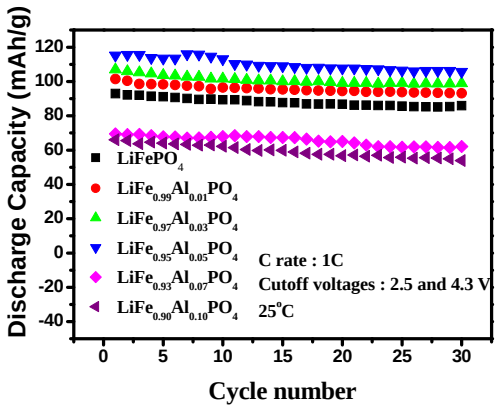

Fig. 3: Results of capacity retention study for the $LiFe_{1-x}Al_xPO_4$/Li coin-type cells

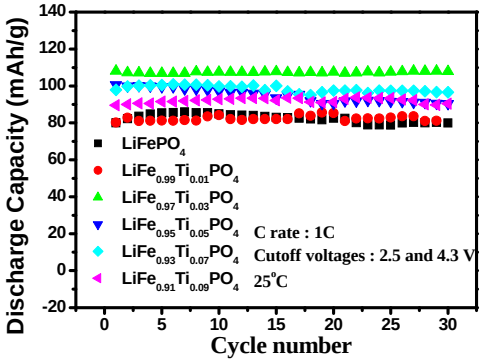

Fig. 4: Results of capacity retention study for the $LiFe_{1-x}Al_xPO_4$/Li coin-type cells

Reference

[1] S.-h. Wu, M.-S. Chen, C.-J. Chien, and Y.-P. Fu, J. Power Sources **189**, 440 (2009).