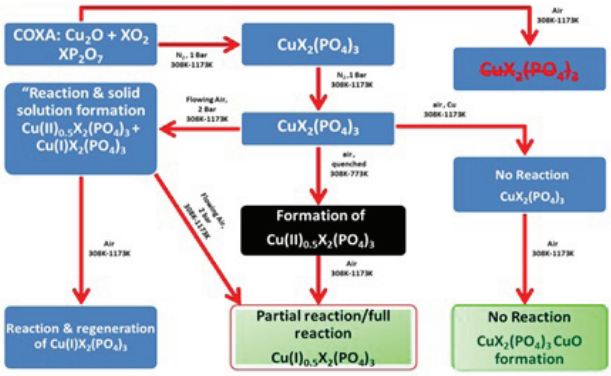

Figure 1. Structural and chemical transformations observed within the $Cu^{I/II}X_2(PO_4)_3$ [X = Ti, Zr, Hf & Sn] series

Keywords: framework materials, thermal stability

MS17-P5 Real-time XRD nd XAS investigation on the influences of vanadium additives to the structural chemical state evolutions of $LiFePO_4$ of a lithium-ion

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The influence of adding vanadium on the structure evolution and electrochemical performance of $LiFePO_4$ were systematically investigated by *in-situ* x-ray powder diffraction and x-ray absorption near edge structure spectroscopy. Our results indicate that the addition of a small amount of vanadium (less than at 1%) significantly reduces the formation of non-crystalline (highly disordered) triphylite and remnant heterosite phases in the cathode of battery especially at higher C rates. By adding vanadium, the cycle stability of $LiFePO_4$ cathode is improved by 14.9% compared to that of pristine $LiFePO_4$ cathode in the batteries. Such an enhancement could be attributed to the improved ion diffusion kinetics and reduced inactive $LiFePO_4$ in cathode by the reversible excess charge – vacancy effects of supervalent-vanadium additive in cathode during electrochemical redox cycles. The most interesting point is the difference between diffraction intensity ratio determined by XRD and ratio of oxidation state of Fe ion determined XAS. Without V additives, this difference is much larger after cycling, which implies the disorder irreversible phase persists.

Keywords: lithium ion battery, XRD, XAS, phase transition