Structure Design of New Cathode Materials for Li-ion Batteries

E.V. Antipov, N.R. Khasanova, O.A. Drozhzhin

Department of Chemistry, Moscow State University, Moscow 119991, Russia
email: antipov@icr.chem.msu.ru

Li-ion batteries originally developed for portable devices can now be found in applications as diverse as power tools, electric vehicles and stationary energy storage. To satisfy the need of current and new applications, Li-ion batteries require further improvement in terms of performance properties (energy and power density, safety and cost).

First generation of cathode materials for Li-ion batteries representing the ternary mixed oxides with spinel or rock-salt derivatives structures has been already widely commercialized. However, these materials have severe limitations in further improvements of their properties related to their structural features. Transition metal compounds containing different polyanion units (XO$_4^{m-}$) (X=B, P, S, Si) are now considered as the most promising cathode materials for next generation of Li-ion batteries. Further advances in the polyanion-containing cathode materials are related to combining (XO$_4^{m-}$ and F$^-$ in the anion sublattice, which is expected to enhance specific energy and power of these materials. Indeed, various fluorophosphates and fluorosulphates have been recently discovered, and some of them exhibit attractive electrochemical performance. The overview of our recent research activity on fluorophosphate cathode materials (Li$_2$MPO$_4$F) for Li-ion batteries with different transition metals will be presented.