$LiFe_{2-x}In_xSbO_6$ Oxides as Li-ion Cathode Materials

Xabier Martinez de Irujo Labalde[1], Josie-May Whitnear, Samuel G Booth[2], Bonan Zhu[3], Michael Hayward[1]

[1]Inorganic Chemistry Laboratory, Department of Chemistry, University of Oxford, South Parks Road, OX1 3QR, United Kingdom
[2]Department of Chemical and Biological Engineering, The University of Sheffield, Sheffield S1 3JD, United Kingdom
[3]Department of Chemistry, University College London, 20 Gordon Street, London WC1H 0AJ, United Kingdom

xabier.martinezdeirujolabalde@chem.ox.ac.uk

Li-ion batteries have transformed daily life by acting as energy dense, rechargeable power sources for a wide range of electronic devices. As part of the UK Faraday Institute FutureCat [1] project we are investigating a range of new lithium-ion battery cathode materials for application in all-electric vehicles. In addition to the normal requirements of maximizing energy density and power output, as part of this project we are also trying to move away from cobalt-based materials due to their poor environmental impacts; we have focused on materials containing earth-abundant elements, with a particular emphasis on iron-based materials. Most of the iron, in particular, Fe^{3+} materials, that have been investigated to-date suffer from a capacity loss after long term cycling, although a good performance can be achieved for the first cycle [2]. This capacity loss is generally attributed to the easy migration of Fe^{3+} between different coordination sites. To get more insight into these issues, we are currently investigating a novel Fe-based system, $LiFe_{2-x}In_xSbO_6$.

In the present work, we have performed a detailed structural characterization of the different members of the solid solution, as well as their electrochemical properties. Based on these results, we will discuss the implications of partial substitution of Fe by In over the electrochemical performance of these Fe-based materials.

[1] https://futurecat.ac.uk/

[2] Li, J. L., Jianjun. Luo, Jing. Wang, Li. He, Xiangming., Recent advances in the LiFeO2-based materials for Li-ion batteries. Int. J. Electrochem. Sci. 2011, 6, 1550-1561.

Keywords: Lithium Ion Cathode Materials, Crystal Structure, Electrochemical Properties