Novel (Li-ion) battery electrolyte materials: what can we envisage for the future?

Prof. **Patrik JOHANSSON**

Chalmers University, Göteborg, Sweden

Novel electrolyte materials are the basic starting point to attack the practical disadvantages that we often face modern batteries at the cell level – performance (energy and power), degradation, life-length, cost, etc. Fundamentally, our electrolytes need to provide a large set of properties e.g.:

– A large amount of highly mobile charge carriers;
– Chemical and electrochemical stability incl. electrode compatibility;
– Safety – low flammability, non-toxicity, etc.

In this presentation a bottom-up academic research based approach will be used moving from predictive computational approaches via proper physical characterisation of model systems up to monitoring resulting safety properties of the electrolytes. Topics covered include:

– Design of novel anions to replace PF_6^-, including fluorine-free anions;
– Methodologies for fast screening of electrolyte material properties;
– Methodologies for assessing the origin of degradation reactions in detail.

Finally, a summary of various current trends for (Li-ion) battery electrolytes is made with a perspective of not only high-lighting large promises, but also the obstacles remaining and how the topics above might be useful as problem solvers.

Biosketch. Patrik JOHANSSON is Professor of Physics at Chalmers University of Technology since 2009 and he holds a PhD in Inorganic Chemistry from Uppsala University. Today his research is mainly focused on electrolytes for Li-ion and next generation batteries (Li-S, Na-ion, Mg, Ca, Al) and he runs a group of 12 PhD students and postdocs. His main interest is indeed to combine the development of better applied performance with an increased understanding of new materials at an atomic scale, often via combining macroscopic property assessments with advanced computational methods. He is Visiting Professor at ICGM during November 2017.