

3<sup>rd</sup> International Conference on

# ELECTROCHEMISTRY

July 10-11, 2017 Berlin, Germany

## Intercalation type electrode materials for fluoride ion batteries

Oliver Clemens  
TU Darmstadt, Germany

Building batteries based on a shuttle of fluoride ions is of interest due to the high stability of fluoride as a charge carrier. Therefore, wide potential windows can be accessible in such battery systems allowing for high energy densities. So far, fluoride ion batteries (FIBs) are mainly fabricated as all solid state batteries using conversion based electrodes. However, conversion reactions are well-known to result in limited battery lifetime due to the large volume changes which arise during the cycling of the battery. In addition, high over-potentials (crystallization, charge transfer) can have a tremendous impact on battery kinetics. To improve battery kinetics, we aim to develop intercalation based fluoride ion batteries with high capacities and high voltage. In this respect, perovskite and perovskite related compounds (e.g., Ruddlesden-Popper type structures) will be shown to serve as host lattices which can intercalate/deintercalate large amounts of fluoride ions, with theoretical capacities reaching ~130 mAh/g and being comparable to lithium ion battery systems. We highlight that such materials can outperform CuF<sub>2</sub> as a high voltage cathode in agreement with by DFT based calculations. Latest developments on the identification of suitable anode materials will be described in addition to an overview of current limitations of anion based battery systems. Finally, we will elucidate structure chemical factors which enable selectivity for the intercalating species for cation (e.g., Li and Na) in comparison to anion based batteries.

### Biography

Oliver Clemens has obtained his PhD from Saarland University, Germany in 2012, followed by Post-doctoral studies from the University of Birmingham, UK. He is Group Leader of the Joint Research Laboratory Nanomaterials, TU Darmstadt and KIT, Germany since May 2013. Currently, he is a Junior Professor within the Materials Science department at the TU Darmstadt, Germany within an Emmy Noether Fellowship from the German Research Foundation. He has published more than 36 papers in reputed journals.

oliver.clemens@nano.tu-darmstadt.de

Notes: