

Entropy, Electrolytes and Electrodes

Professor Patrik Johansson¹

¹Uppsala University, , Sweden

It has become a trend in the battery field to talk about designed or engineered electrolytes and electrodes – and not seldom this is combined with the “buzzword” entropy. The very role of entropy is, however, far from often clear – or perhaps not even present in the materials.

We have now during the last 5-6 years, created and studied in details a wide range of both low, medium and high entropy electrolytes and electrodes for really try to outline/probe the possible role of entropy for observed properties – alongside impressive performance.

Basically, high-entropy alloys (HEAs) have their main feat in that they (ideally) are more mechanically stable, i.e. show improved cycling stability for the conversion-alloying reactions, than conventional battery alloy anode materials, while high entropy electrolytes, most significantly molten salt electrolytes (MSEs), which can be stepping-stones towards completely solvent-free and semi-solid room-temperature electrolytes, have uniquely modified local structure and dynamics. There is much to learn from these early proof-of-concept studies that hopefully also can be transferred to next generation battery chemistry and technology.

The “smörgåsbord” I provide will most hopefully induce some order in the entropy!