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Electrolytes – Materials Review

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Abstract. Electrolytes are vital components of a battery. They are usually composed of a solvent or mixture of solvents and a salt or a mixture of salts which provide the appropriate environment for ionic conduction.

One of the main issues associated with the selection of a proper electrolyte is that its electronic properties have to be such that allow a wide electrochemical window-defined as the voltage range in which the electrolyte is not oxidized or reduced-suitable to the battery operating voltage. In addition, electrolytes must have high ionic conductivity and negligible electronic conductivity, be chemically stable with respect to the other battery components, have low flammability, and low cost.

Weak stability of the electrolyte against oxidation or reduction leads to the formation of a solid-electrolyte interface (SEI) layer at the surface of the cathode and anode respectively.

Depending on the materials of the electrolyte and those of the electrode, the SEI layer may be composed by combinations of organic and inorganic species, and it may exert a passivating role. In this talk, we will discuss the current status of knowledge about electrolyte materials properties, the SEI layer formation, and challenges for a first-principles guided design of stable electrolytes.