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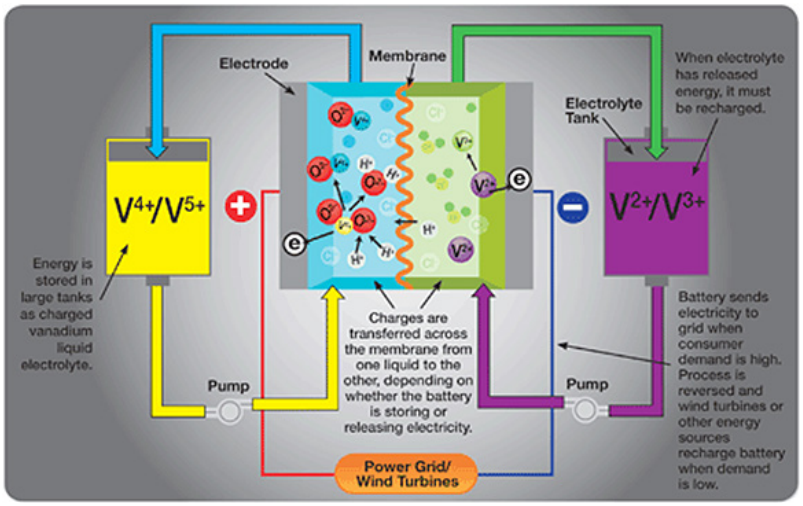
STUDY OF VANADIUM REDOX FLOW BATTERIES (VRFBS) AND PERIPHERALS

Etude des batteries redox flow au vanadium (VERB) et des périphériques

The power from the renewable energy recourses is acquiring a lot of attention due to increasingly pressing concerns about environmental issues and exhausting conventional power sources. Due to intermittent nature of the renewable energy resources and their low energies densities, put serious limit on the practical and commercially viability of these resources. The Energy storage systems like vanadium redox flow batterries provide sustainable improved solution against these limitations.

The electrode material selection is quite important in the overall stack design of the VRFB. The electrode material must be inert in the acidic electrolytic conditions and provide low overpotential for positive and negative half cell reactions. Various carbon based materials were investigated (Graphite felt, Carbon felt, graphite fibers, carbon paper, glassy carbon) by different research groups, but most often they exhibit low electrocatalytic activity and poor kinetic reversibility for the vanadium redox couples.
The project concerned involved the activication, modification of Graphite felt by chemical, thermal, electrochemical methods and by grafting diffrent metalic oxide nanoparticles in fibrous structure of the polyacrylonitrile (PAN)-based graphite felt (GF) to improve the electrolytical avtivity of the electrode.



The resultant electrodes are characterized by cyclic voltammetry, Linear sweep voltammetry, FTIR, SEM, XRD and Raman spectroscopy. The performance of the electrodes are also evaluated on the stack level by number of charge-discharge cycles of the Vanadium redox flow battery. The mass, energy and charge balances are also done for stack design. Moreover, the improvement in faradic yield, energy Efficiency and voltage efficiency of VRFB are also evaluated.