



## **Chemistry of materials for electric energy conversion and storage**

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Basics of electrochemistry in respect to electrocatalysis and ionic of chemical power sources. The role of adsorption in electrode processes; electrocatalysis. Similarities and differences between “solid state” and “liquid” electrochemistry. Examples of electrode processes: hydrogen H<sub>2</sub>, methane, methanol oxidation. Dioxygen molecule reduction, novel catalysts for dioxygen reduction.

Materials for high power rechargeable batteries (HPRB): insertion materials; graphite, nanocarbons, titania nanoparticles, alloys, reticulated vitreous carbons. Transition metal oxides and sulfides as intercalation materials. Selectivity phenomenon for layered and spinel structured oxides.

Synthesis and properties of solid polymer electrolytes, ceramic electrolytes, gel type electrolytes and liquid electrolytes for electrochemical cells.

Electrochemical capacitors (EC): pseudocapacitors and double layer capacitors EDLC. The role of pseudocapacitance for energy storage. Electrodes; inorganic oxides electrodes (MeOx), conducting electroactive polymers (p-type and n-type systems), redox polymers. Electroactive organic/inorganic materials. Electrode/electrolyte interfacial properties in aqueous and nonaqueous media. Symmetric and asymmetric devices. Nonaqueous chemistry for filling a gap in power/energy spectrum.