**Battery Supercapacitors**

1. History, basics, and definitions

* Battery components
* Important abbreviations (SOC, SOD, SOH, EOL, DOD)
* Galvanic cells (the Daniell cell)
* Oxidation reaction
* Reduction reaction
* Standard potentials (E 0)
* Nernst equation
* Overpotentials

1. charge transfer overpotential
2. diffusion overpotential
3. reaction overpotential
4. crystallization overpotential

* Electrochemical series
* Energy density

1. Primary cells

* specific energy and specific power
* shelf life
* discharge characteristics
* Electrolytes
* classes and concentration dependency
* Alkaline Manganese Batteries
* Properties (slide 39)
* Components (materials and specifications) (slide41+42)
* Reactions
* H 2 producing side reaction
* Vulcan curve
* Alkaline batteries manufacturing and construction
* Advantages of Alkaline cells
* “Advantages” of Zink carbon cells
* Zinc-carbon (“LaChance”) batteries
* Zinc Air batteries
* Lithium Primary Batteries

1. Secondary cells („accumulators “)

* liquid non aqueous (“aprotic”) electrolytes
* Lithium and Lithium-Ion Batteries

1. Supercapacitors

Exam Questions

What is the battery and main function? Slide 5

What is the main battery component (4)? Slide 6

What are the following abbreviations for (SOC, SOD, SOH, EOL, DOD)?

What are the main components of the first modern battery? Slide 8

What is the Galvanic cell and its classification?

Compare between Primary and secondary cells inside of recharging, conversing? Slide 11

Calculate the oxidation number?

Specify the reaction coefficient?

What is the Overpotential and its sources? Slide 17

What is the source of the heat in the batteries? Slide 17

What is the unit of the following?

* Energy density: Wh/L
* Specific Energy: Wh/kg
* Specific power: W/kg

What is the using of **Ragone Plot?**

Give the types of the primary battery?

Compare between the batteries from

* Overall reaction (RedOx)

1. Alkaline
2. Zinc-Air
3. Zinc-Carbon (laclanche)

Lithium

1. Lithium Manganese Dioxide (Li -MnO2) batteries
2. Lithium Carbon Monofluoride Li- CFx battery
3. Lithium Li -FeS 2 battery
4. Lithium- Thionyl chloride (Li - SOCl 2) battery
5. Lithium Sulfur Dioxide (SO 2) battery
6. Lithium Li–I2 Iodine battery

Describe the steps of alkaline batteries manufacturing? (slide45)