HYDROGEN ENERGY STORAGE FOR ON-BOARD FUEL CELLS, CONCENTRATED SOLAR POWER AND SECONDARY BATTERIES

Sesha S. Srinivasan*, Ryan Integlia, Jorge Vargas, Florida Polytechnic University, FL

D. Yogi Goswami, Elais K. Stefanakos, D. Emre Demirocak, University of South Florida, FL

Sarada Kuravi, Florida Institute of Technology, FL

***Tuskegee University, AL**

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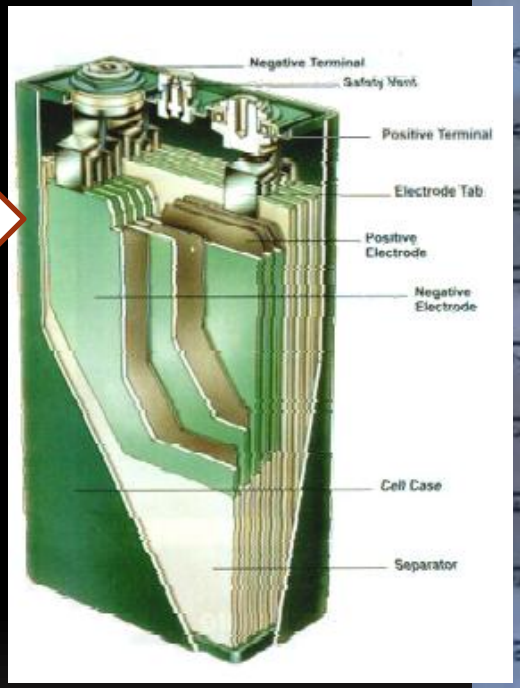
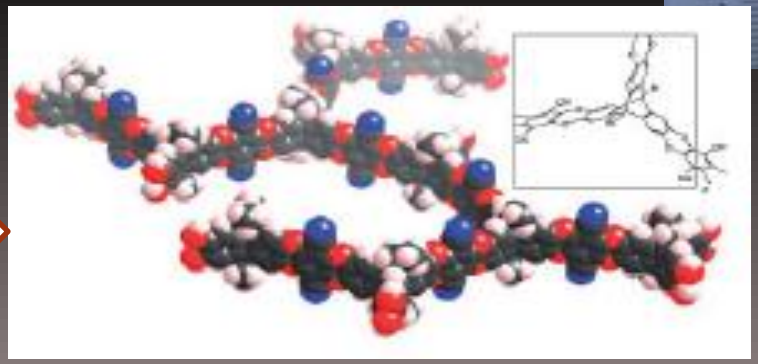
ENERGY STORAGE

Solar Thermal Storage
- Phase Change Materials
- Hydrides/Hydrates

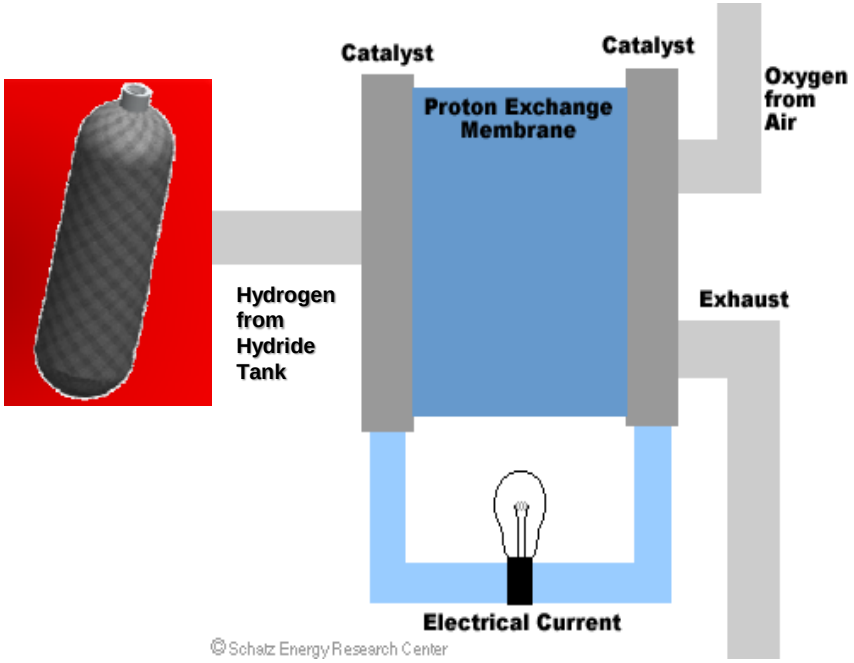
Electrochemical Storage
- Li-ion Batteries
- Metal Hydrides Batteries

Hydrogen Storage
- Physisorption
- Chemisorption

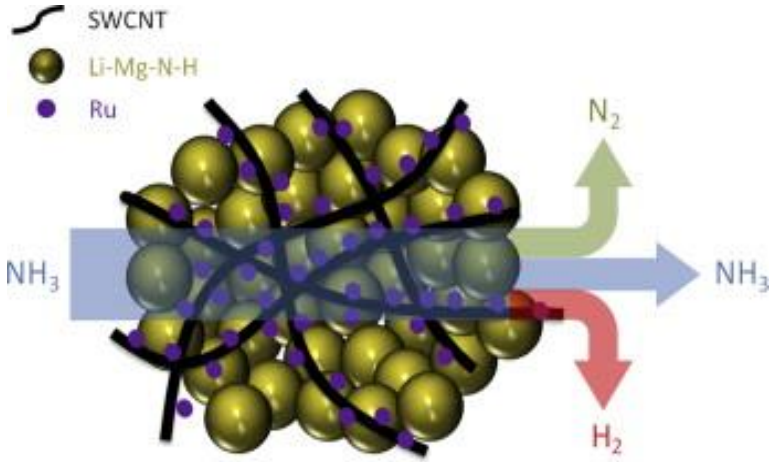


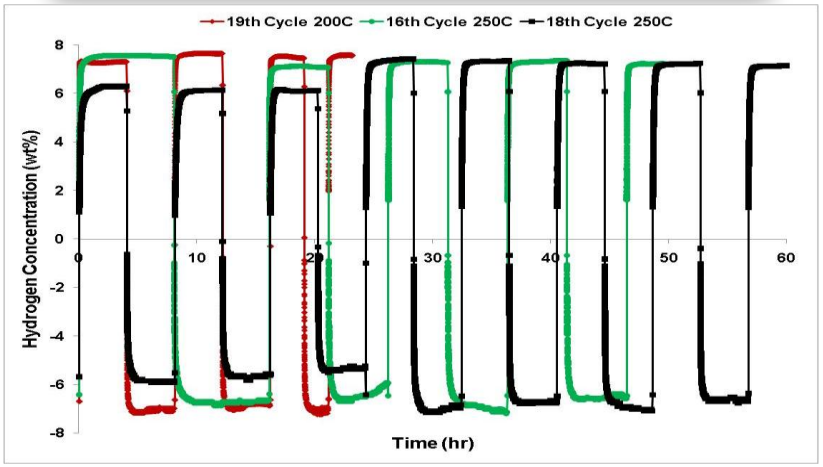


Hydrogen Storage Materials For Fuel Cell Vehicles



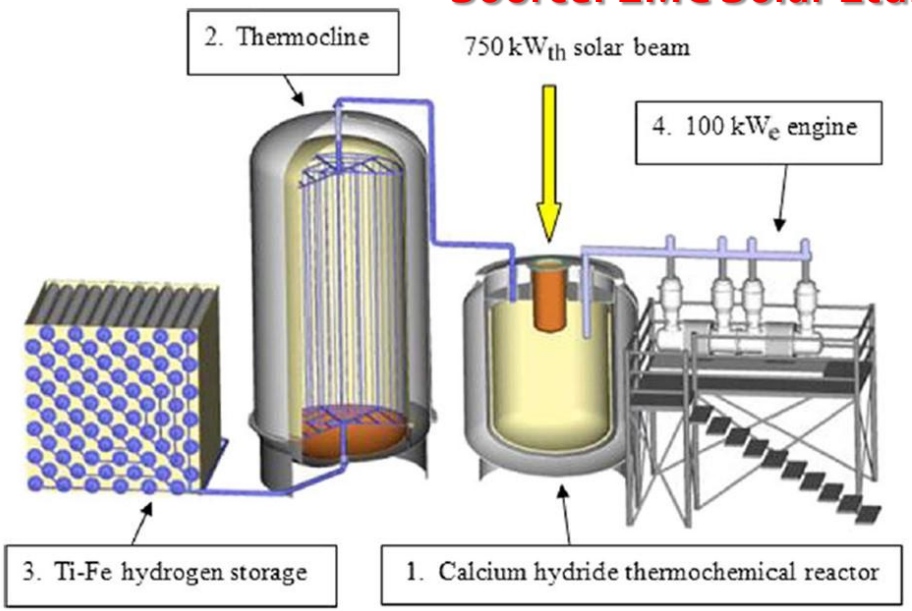
- System Volumetric Capacity
- System Gravimetric Capacity
- Storage System Cost
- Durability / Operability





Hydrogen Storage Materials For Conc. Solar Power

Source: EMC Solar Ltd.

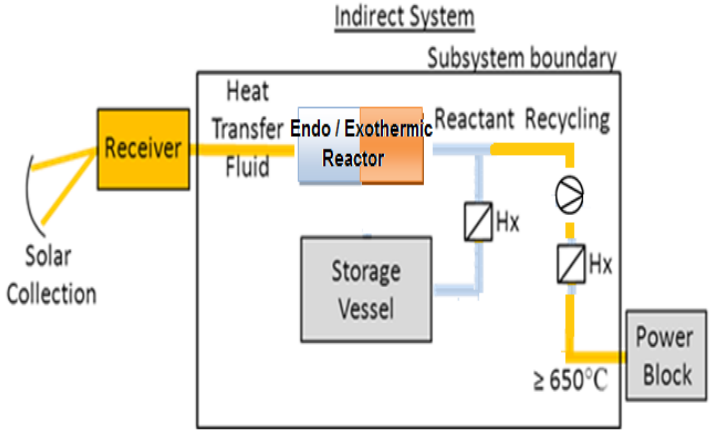


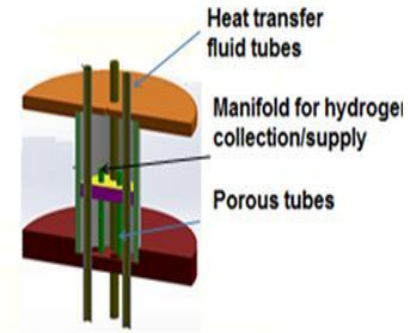
Temperature Swing Hydrides

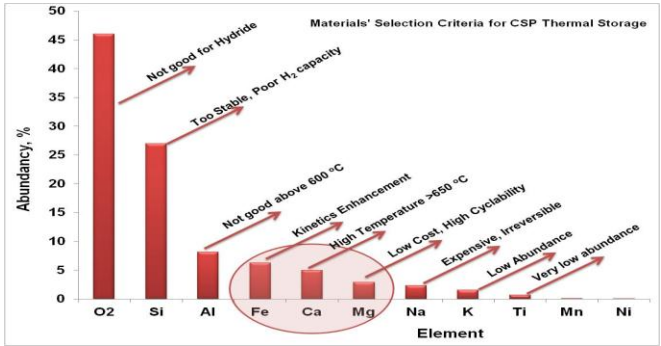
Volumetric Storage Capacity

Exergetic Efficiency

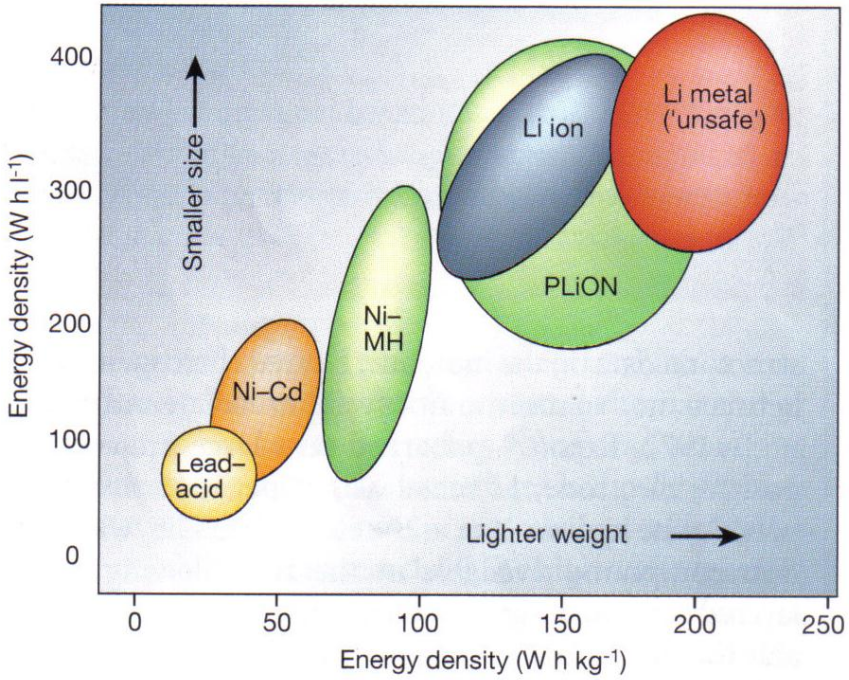
Reaction	Enthalpy (kJ/mol)	ΔG/ΔH Value (%)	Energy Density (kJ/kg)	Energy Density (kJ/m^3)	Reaction Extent (%)
$Ca + H_2 \leftrightarrow CaH_2$	181	~80	4494	~6.0X10^6	95
$CaH_2 + Fe \leftrightarrow Ca_2FeH_6$	~150	~95	~3660	~4.5X10^6	~ 90
$4CaH_2 + 3MgH_2 \leftrightarrow Ca_4Mg_3H_{14}$	~130	~72	~3650	~4.0X10^6	~95
$4CaH_2 + 4MgH_2 + 3Fe + 3H_2 \leftrightarrow Ca_4Mg_4Fe3H_{22}$	~165	~74	~3500	~3.5X10^6	~90







Hydrogen Storage Materials For Secondary Batteries



- Energy Storge Density
- Power Density
- Recyclability / Life Cycle
- Materials Safety & Cost