

ELECTRIC VEHICLE BATTERIES

Dr.Kyaw Kyaw Moe

20.8.2023

ELECTRIC VEHICLES

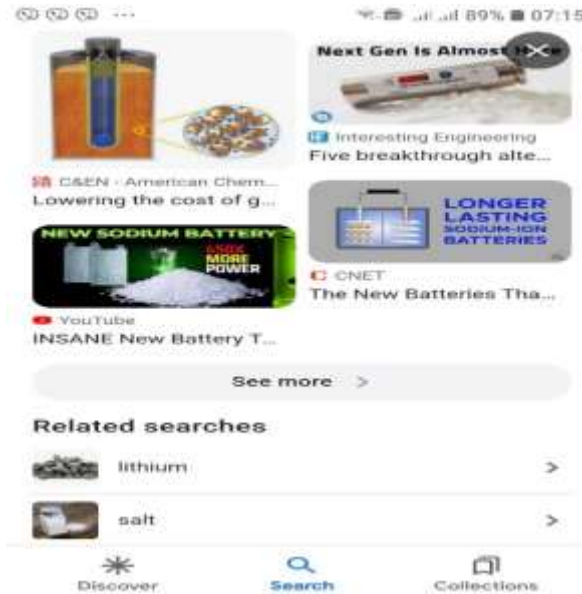
- Unmanned aerial vehicles tram
- Car(passenger ,luxury) train
- transit bus heavy duty truck
- passenger van mass rapid transit
- bicycle(E bike) motorbike
- Scooter rickshaw
- Ship , boat spacecraft
- Wheelchair AI suitcase

ELECTRIC VEHICLES



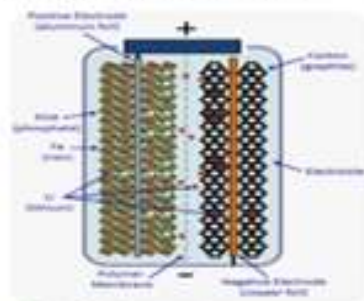
Various types of battery technology

- Lead acid
- Lithium-ion
- Solid state
- Hydrogen
- Nickel-metal hydride
- Ultra capacitors
- Hybrid (Nickel metal hydride)
- Plug in hybrid
- Flow batteries
- Lithium-iron phosphate

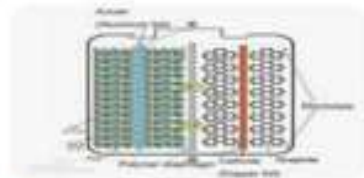




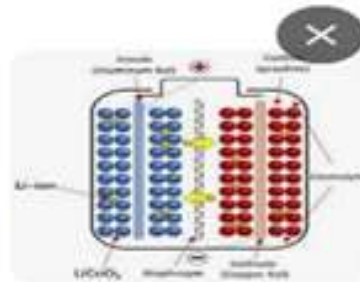
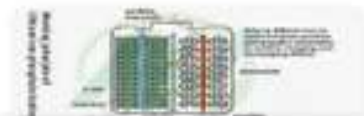
Related content



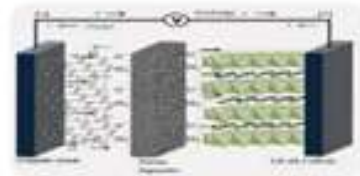
ReBel Batteries
How Are Lithium Iron ...



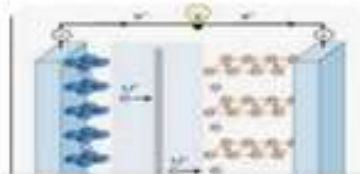
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Four Advantages of Lit...



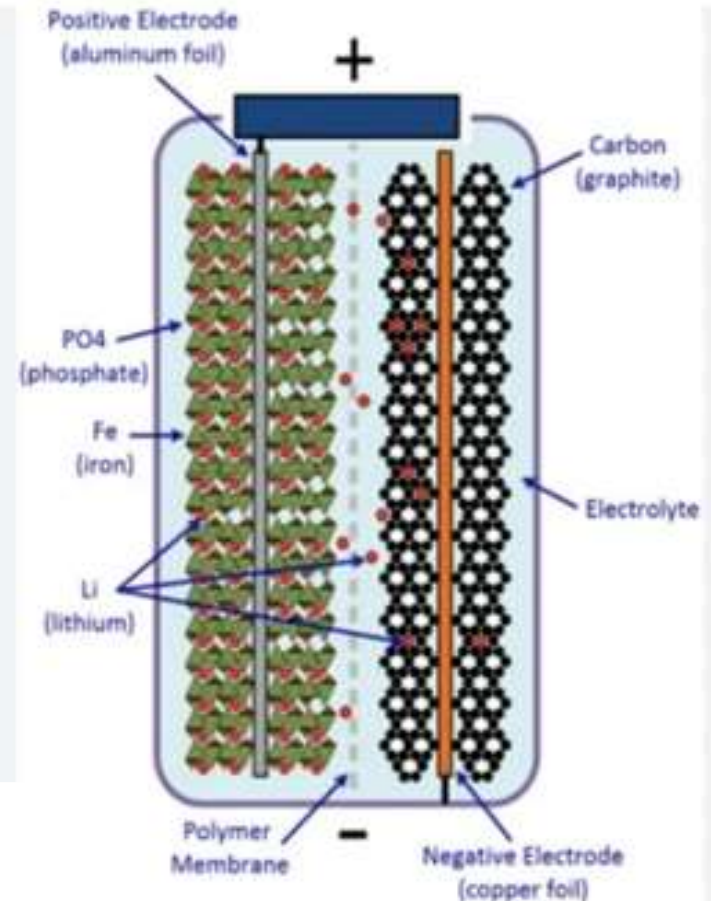
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All About Circuits



A Closer Look at Lithium Iron Phosphate Batteries, Tesla'...

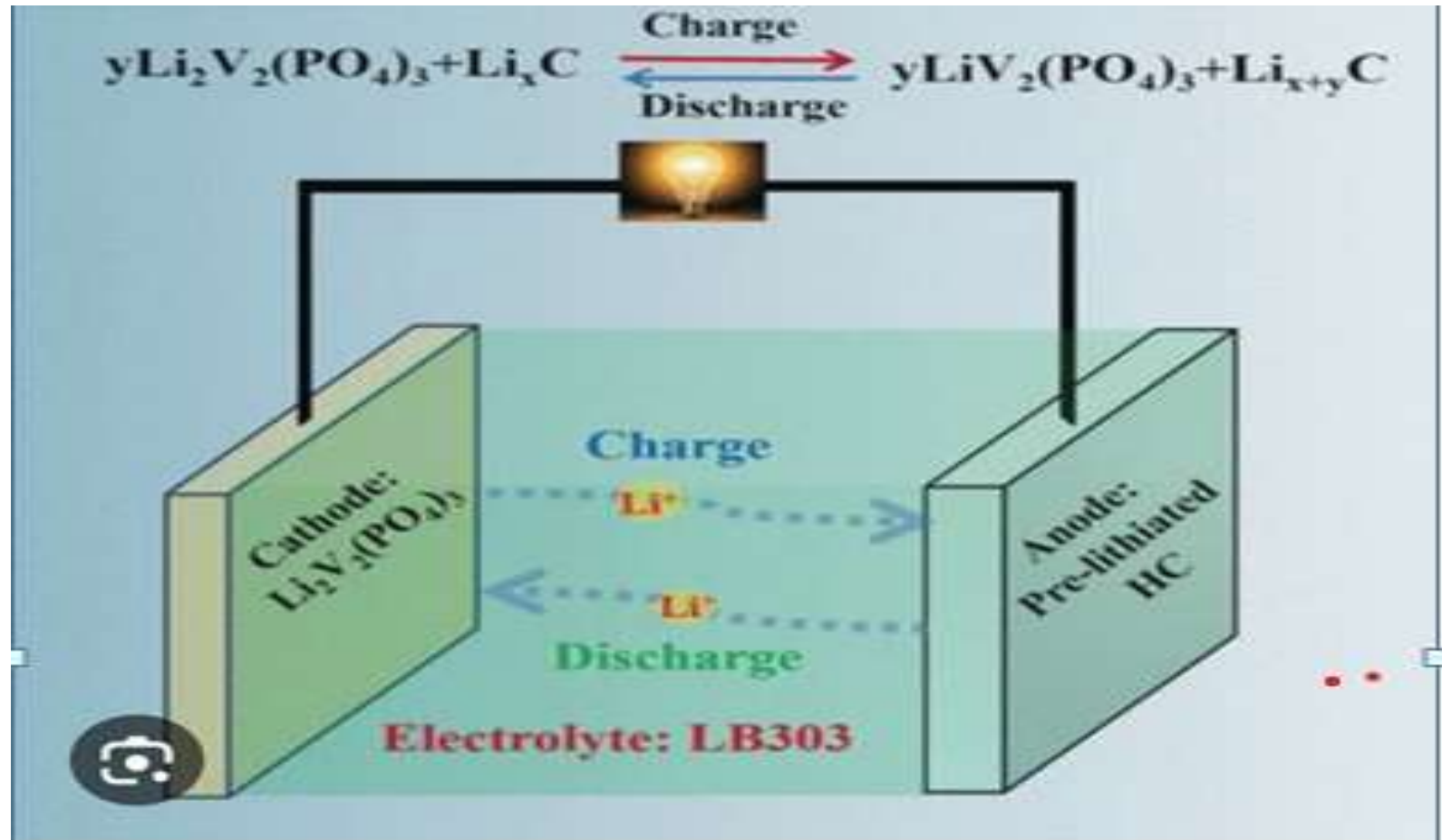
ELECTRIC VEHICLES BATTERY



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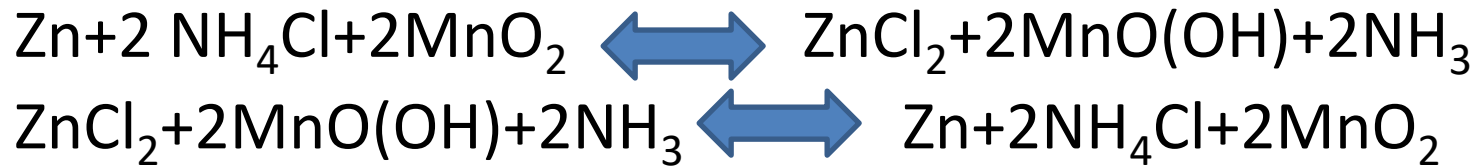


Lithium Ion Battery

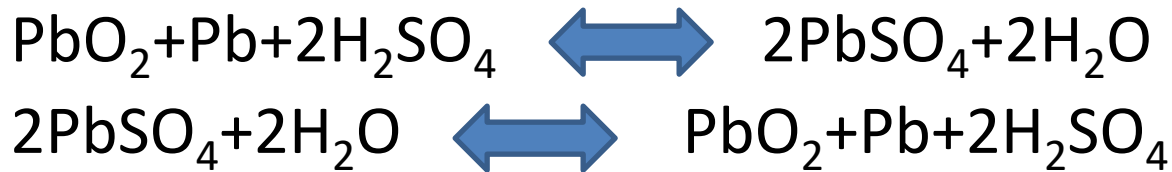


High-rate and long-life
lithium-ion battery with...

Leclanche' Cell



Lead Acid Battery



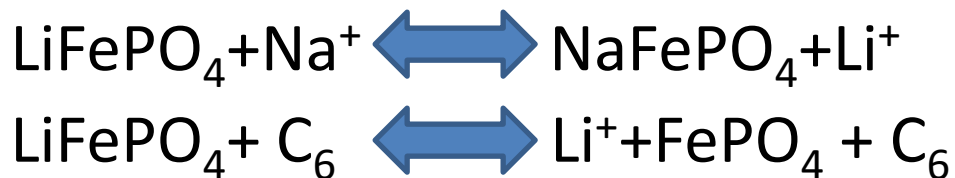
Zn Air Battery



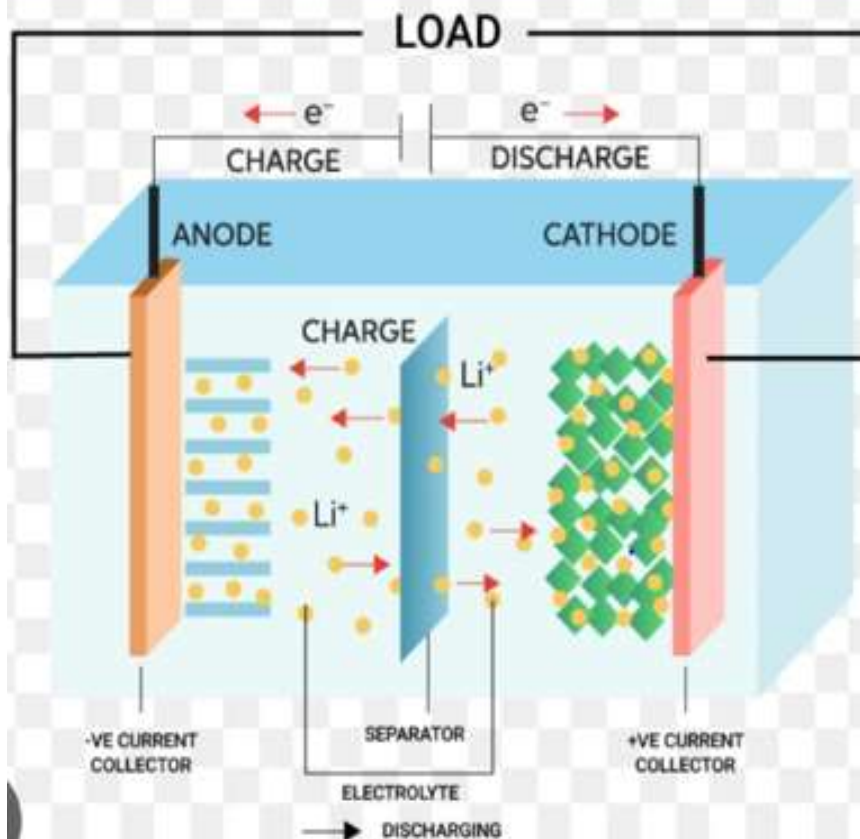
Sodium Iron Phosphate Battery



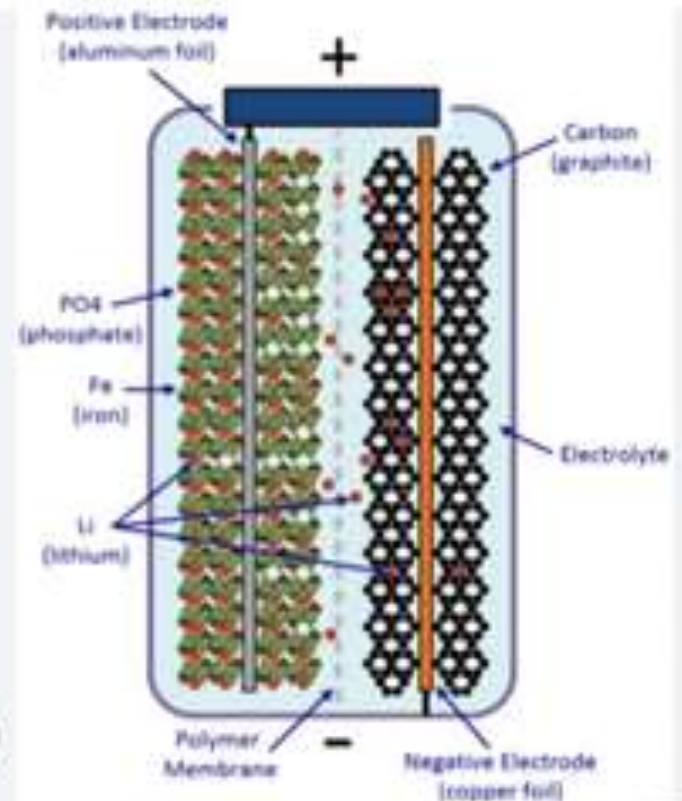
Life PO 4 Battery



COMPONENTS OF LITHIUM-ION BATTERY



All About Circuits



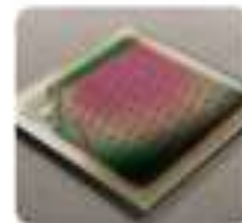
A Closer Look at Lithium Iron Phosphate Batteries, Tesla'...



What is the new type of battery?



Researchers at TU Wien (Vienna) have developed a groundbreaking oxygen-ion battery, which boasts exceptional durability, eliminates the need for rare elements, and solves the problem of fire hazards.



May 15, 2023

<https://scitechdaily.com/scientists-invent-a-new-type-of-battery-the-oxygen-ion-battery/>

Scientists Invent a New Type of Battery – The Oxygen-Ion Battery

What's better than lithium?



Compared to lithium-ion batteries, **solid-state batteries** are more efficient, packing more power with the same size battery. As a result, EV batteries could become more compact, charge faster and weigh less, which could increase range. Feb 15, 2023





The different types of batteries being used today are lithium-ion, nickel-metal hydride, lead-acid, and ultracapacitors. New technology such as solid-state batteries are just a few years away from being used in EVs and will change the way people think about electric cars. For one thing, they have a range of over 500 miles single charge.




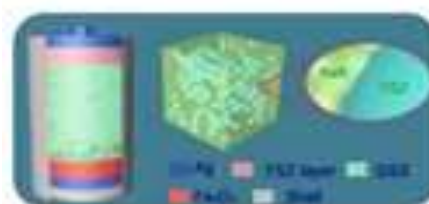
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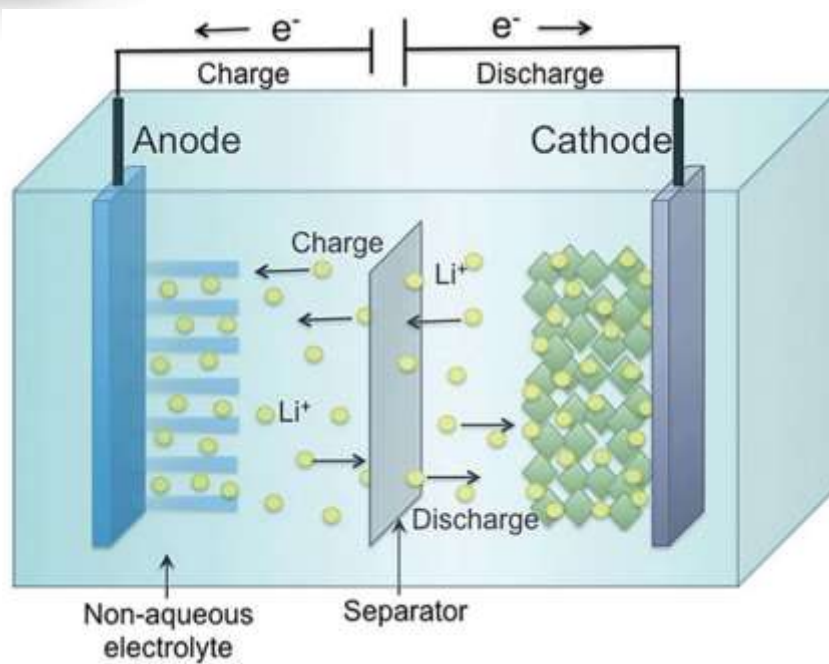
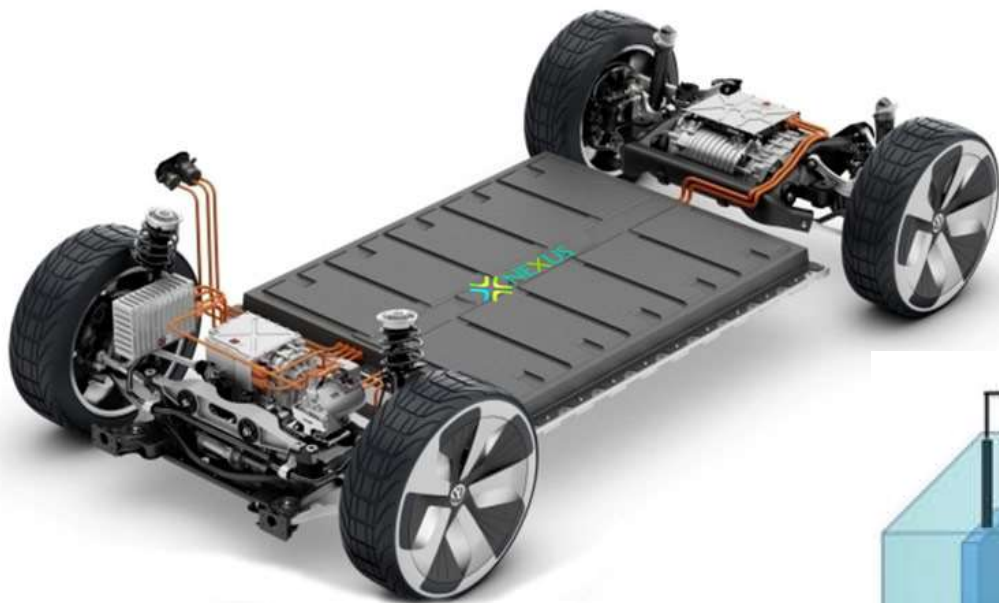
 internationales verkehrs...
Salt as a key ingredien...



 The Daily Beast
This Low-Cost, Fire-Re...



 Interesting Engineering



2023 Fastest Charging



- Lucid air- 350 kW 15 minutes
- Hyundai 6-350 kW 18 minutes
- Audi 270 kW 21 minutes
- G E 22 minutes

BATTERIES

- EVs
 - Battery Electric Vehicles(BEVs)
- Plug in Hybrid Electric Vehicles(PHEVs)
 - Use battery to power
- Portable Electronics
 - Smart phones , laptops, tablets, smart watches
- Renewable energy storage
 - Solar panels ,wind , turbines,
- Power back up
 - Uninterruptible power supply
- Consumer electronics
 - Remote controls , cameras ,toys , and various gadgets
- Medical devices
 - Hearing aids , pacemakers , insulin pumps
- Tools & equipment
 - Cordless power tools , gardening equipment
- Aerospace
 - Electric aircraft& drones,
- Drones utilize batteries for propulsion & power system
- Marine applications
 - Electric boats & ship propulsion
- Stationary storage
 - Home, businesses energy storage

- BEVS Typically powered by batteries
- PHEVs Plug in hybrid electric vehicles
- Trams Public transportation-run on tracks & powered by electricity
- Trolley buses , trackless trolleys
- smartphone ,laptops ,tablets , smart watches ,hearing aids , pacemakers , insulin pumps , robotic vacuum cleaner & Segway , tools, AI powered suitcase , use rechargeable Li-ion batteries

- energy storage
- home energy back up
- grid stabilization
- demand response
- electrical cost saving
- mobile charging stations
- Micro grid
- second life application
- remote power
- renewable integration

Battery technology

- Capacity Wh , kWh
- Size
- AA Alkaline battery 2500-3000 mAh or roughly 5-6 Wh
- Smart phone battery 2000 mAh-over 5000mAh
depend on model 10 -25 Wh
- Laptop battery 30 Wh-100Wh
- Electric car battery 40kWh-over *100 kWh*
model & manufacturer
- Home energy storage 5 kWh-20 kWh
battery solar system
- Grid scale energy storage 10 MWh -100 MWh

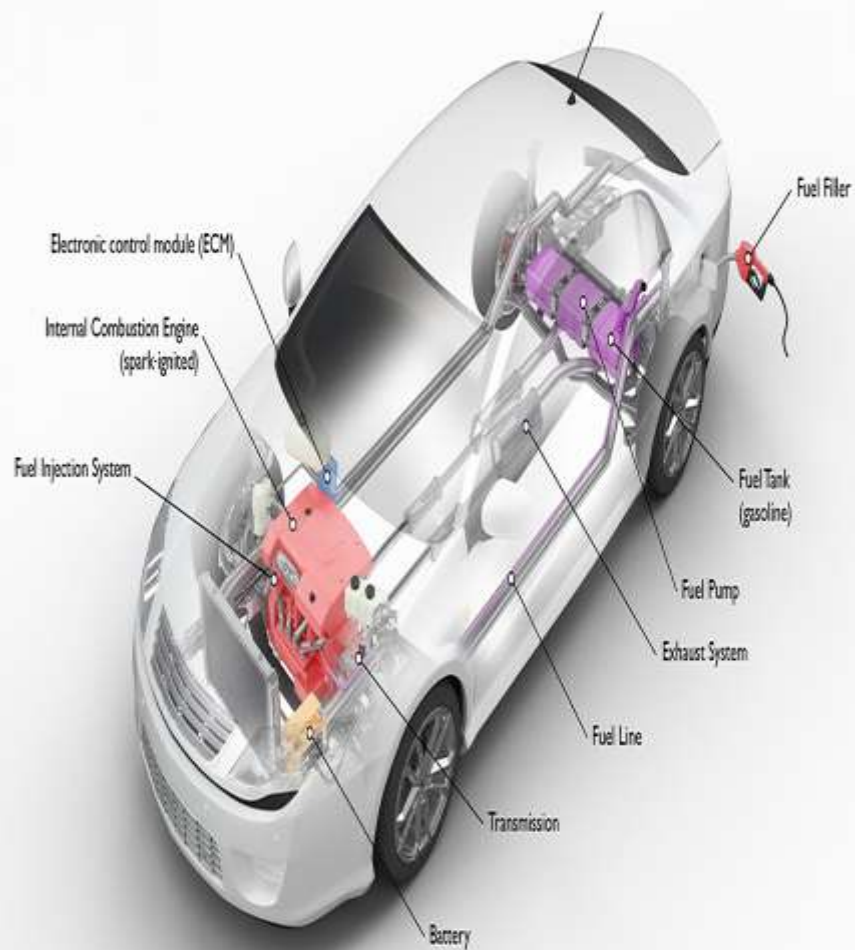
BMS SYSTEM



What is BMS?

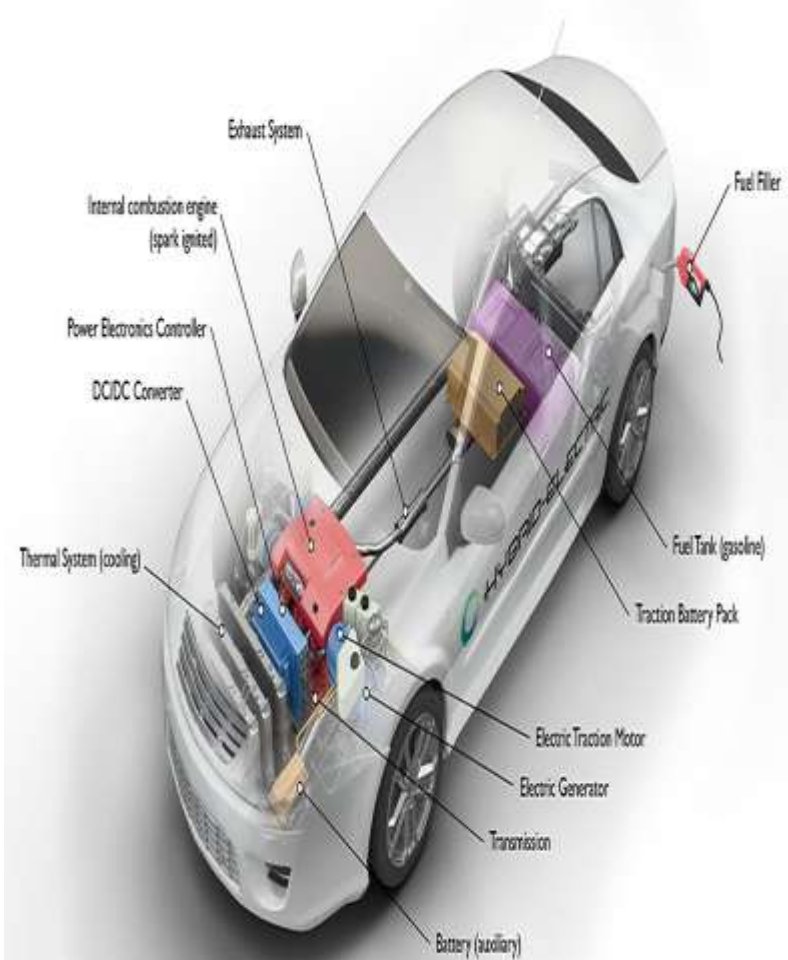
BMS (Battery Management System) is an Electronic Control Unit just like in ICE Cars. This system works as a control unit which maintains the stored energy not to be wasted, for the High Voltage Current to be safely performed and ensuring the best performance while

Gasoline Vehicle



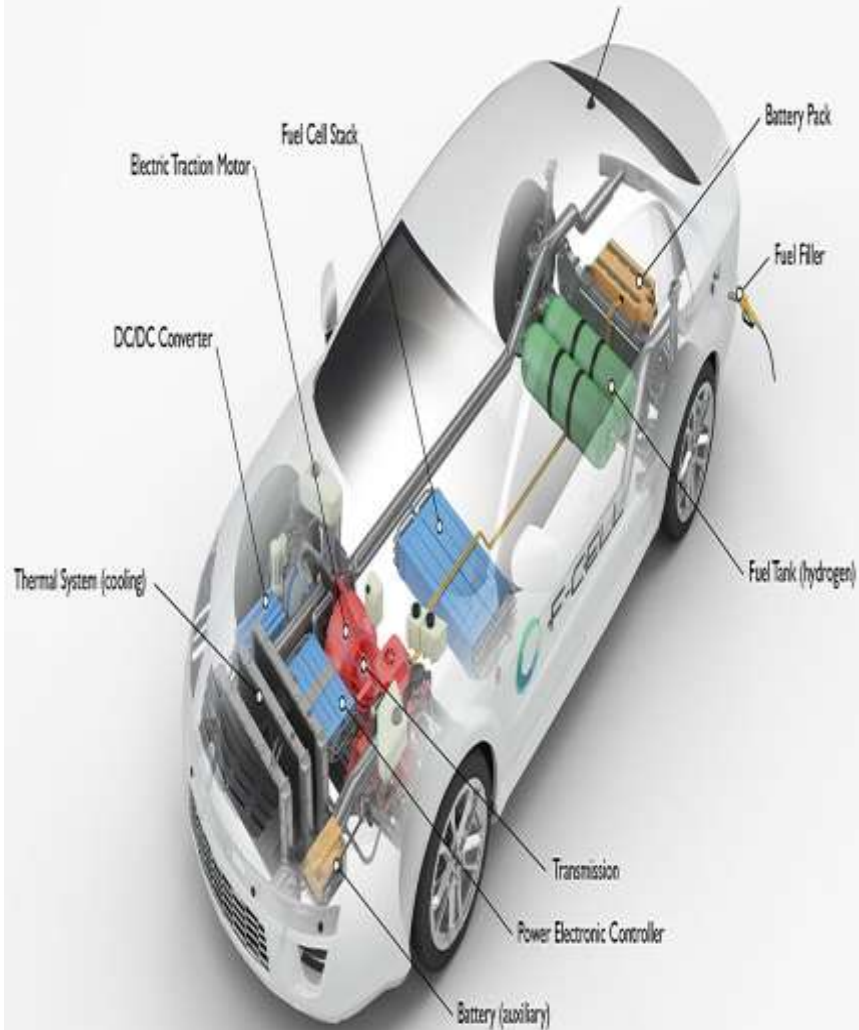
afdc.energy.gov

Hybrid Electric Vehicle



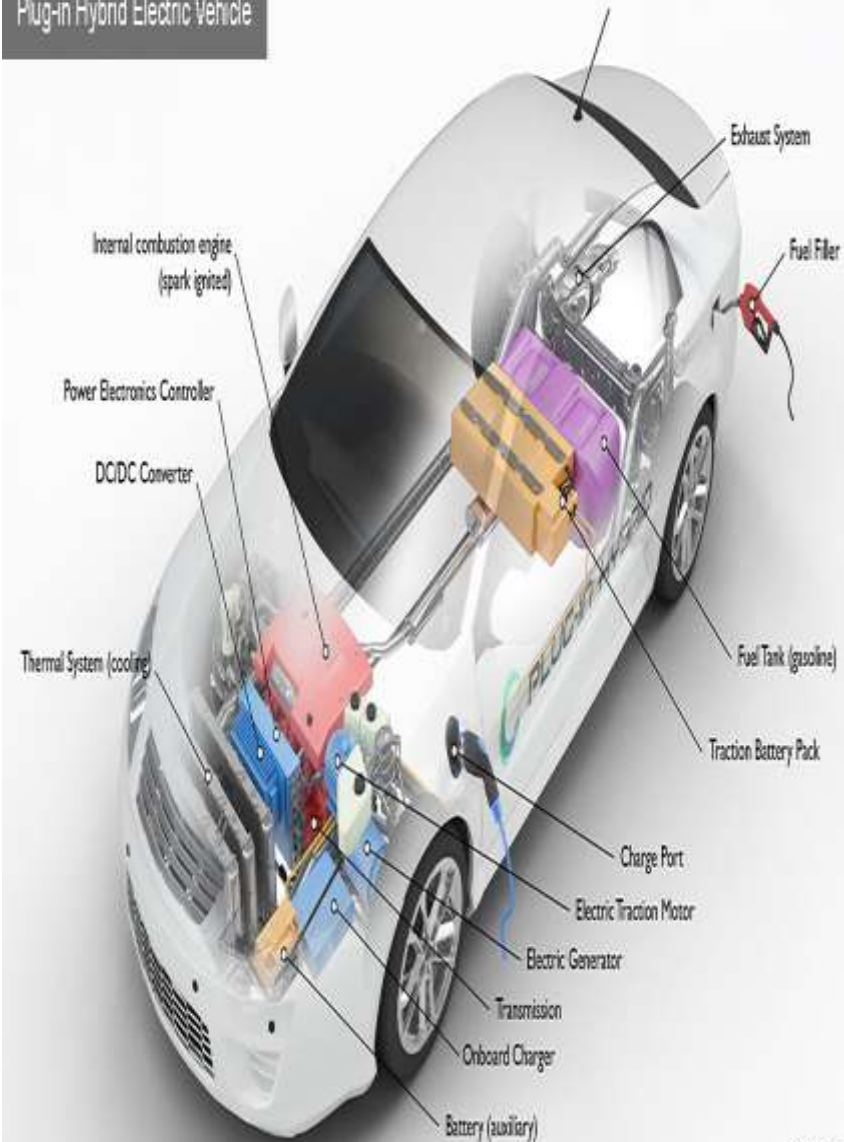
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Hydrogen Fuel Cell Vehicle



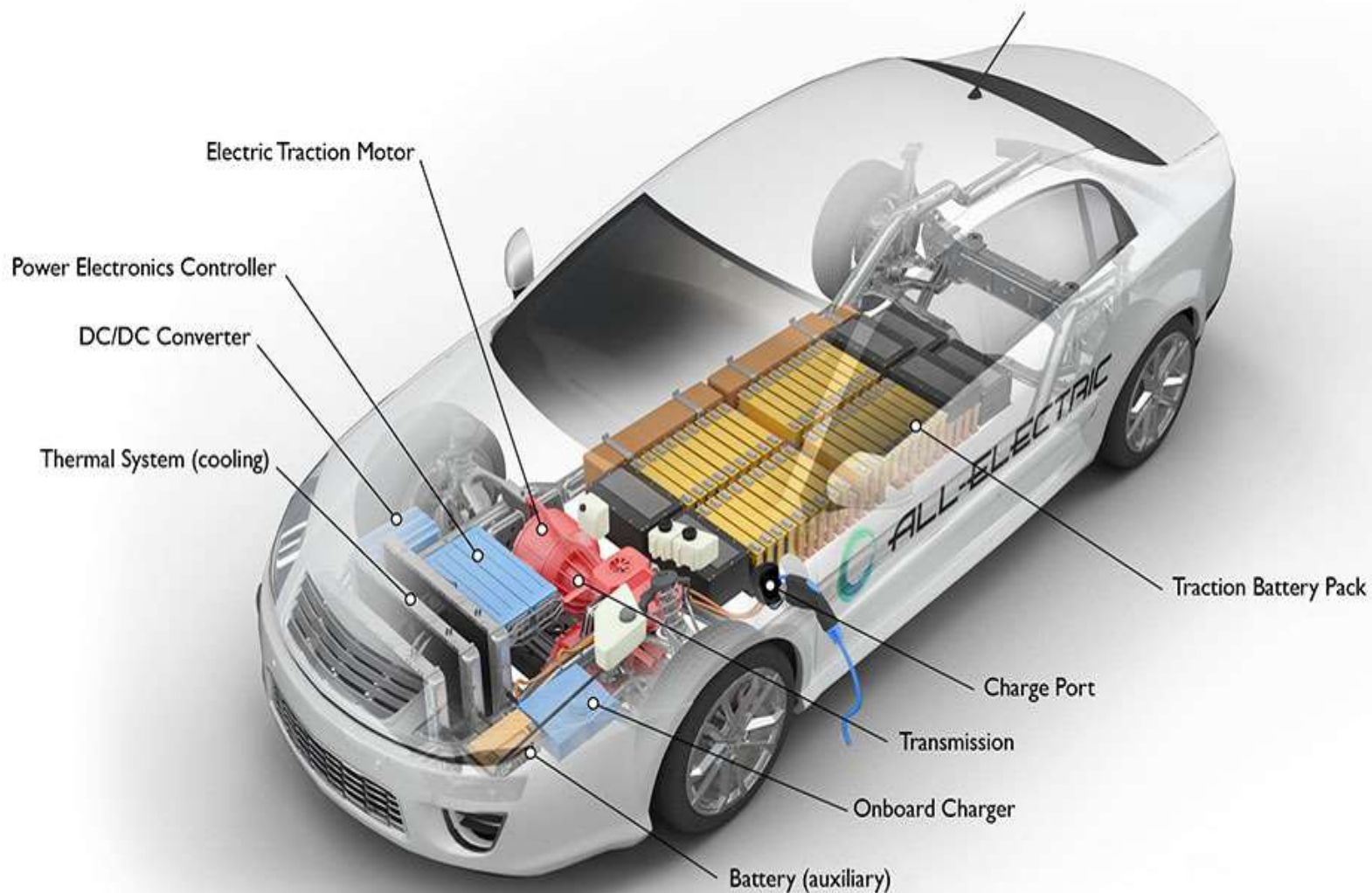
atb energy

Plug-in Hybrid Electric Vehicle



atb energy

All-Electric Vehicle



TYPES Of FUEL CELLS

- Polymer electrolyte membrane fuel cells
- Direct-methanol fuel cells
- Phosphoric acid fuel cell
- Molten carbonate fuel cell
- Solid oxide fuel cells
- Combined heat & power
- Regenerative fuel cells

Advantages & Disadvantages

ADVANTAGES

- ✓ Environmental benefits
- ✓ Lower emissions
- ✓ Lower operating costs
- ✓ Quiet operation
- ✓ Instant torque
- ✓ Reduced noise pollution
- ✓ Energy efficiency

DISADVANTAGES

- Limited range
- Charging infrastructure
- Charging time
- Battery degradation
- Initial cost

Latest development in EVs battery technology

- Oxygen ion batteries(Vienna)
- Fluoride containing batteries
- HGLB (High Gravimetric Lithium Battery)
- Tesla, GM, Ford, VW, Nissan, Rivian are advancing battery technology
- EV batteries can also include other materials such as Mn used in cathode matl
- Al is used for battery case
- Li-ion battery --lithium, cobalt , Ni & graphite
- FUELCELL-----Platinum(catalyst),hydrogen & oxygen

EXCESS ELECTRICITY STORE THE POWER WITHOUT BATTERY

- **PUMPED HYDRO STORAGE**-to pump water from a lower reservoir to a higher ones ,release downhill & turning turbines to get electricity
- **Compressed air energy storage**
- **Flywheel energy storage**-kinetic energy
- **Thermal energy storage**-heat or cool
- **Hydrogen storage**
- **Gravitational energy storage**
- **Superconducting magnetic energy storage**

THANK YOU