

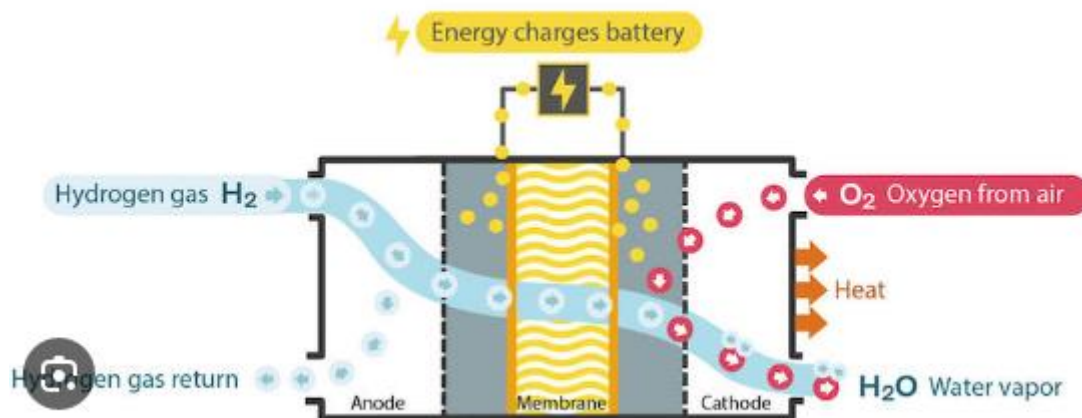


19MEE402 Hybrid Technology

UNIT 5-Fuel Cells for Electric vehicles

Fuel Cells

Fuel cells are a promising technology for powering electric vehicles (EVs) as an alternative to traditional battery electric vehicles (BEVs). While both fuel cell vehicles (FCVs) and BEVs are considered electric vehicles, they use different methods to generate the electricity that powers the electric motor. Here are some key points about fuel cells for electric vehicles:



How Fuel Cells Work:

1. **Chemical Reaction:** Fuel cells generate electricity through an electrochemical reaction between hydrogen and oxygen. The most common type of fuel cell for vehicles is the proton exchange membrane (PEM) fuel cell.
2. **Hydrogen Fuel:** Hydrogen gas (H₂) is fed into the fuel cell from a storage tank. Oxygen is taken from the air.
3. **Electrochemical Process:** Within the fuel cell, hydrogen is split into protons and electrons. The protons move through a membrane, while the electrons are forced through an external circuit, generating an electric current.
4. **Water and Heat:** The byproduct of the reaction is water and heat, making fuel cells a clean and environmentally friendly technology.

Advantages of Fuel Cells for EVs:

1. **Quick Refueling:** Refueling a fuel cell vehicle is faster than recharging a battery electric vehicle. It takes a few minutes to fill a hydrogen tank, compared to the longer charging times for batteries.
2. **Longer Range:** Fuel cell vehicles can achieve longer driving ranges compared to many battery electric vehicles. This is advantageous for applications where extended range is critical.
3. **Reduced Weight:** Fuel cell vehicles can potentially be lighter than equivalent battery electric vehicles, as the energy is stored in the form of hydrogen gas rather than heavy batteries.

Challenges and Considerations:

1. **Hydrogen Infrastructure:** One major challenge for fuel cell vehicles is the lack of a widespread hydrogen infrastructure. Establishing a network of hydrogen refueling stations is expensive and requires significant investment.
2. **Costs:** Currently, fuel cell vehicles are generally more expensive to produce than battery electric vehicles. The cost of fuel cells and hydrogen production technologies needs to decrease for wider adoption.
3. **Efficiency:** While fuel cells are efficient, the overall efficiency of the hydrogen production and distribution process can be lower compared to the direct charging of batteries.
4. **Environmental Impact:** While fuel cells themselves produce zero emissions, the overall environmental impact depends on how the hydrogen is produced. If produced from renewable sources, hydrogen can be considered a clean energy carrier.