Hydrogen and fuel cell technology in automotive applications

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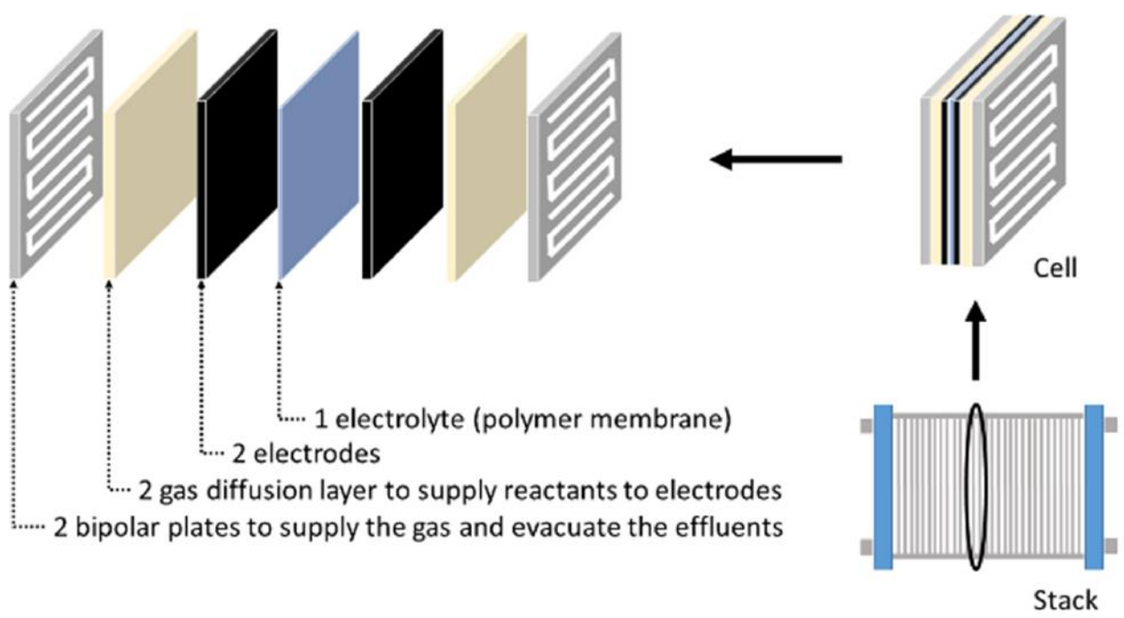
Context:

This paper introduces the key components of fuel cell electric vehicles, including proton exchange membrane fuel cell stack, auxiliary energy storage system, hydrogen supply system, hydrothermal management system and control system, and explains the operation principle.

Objectives:

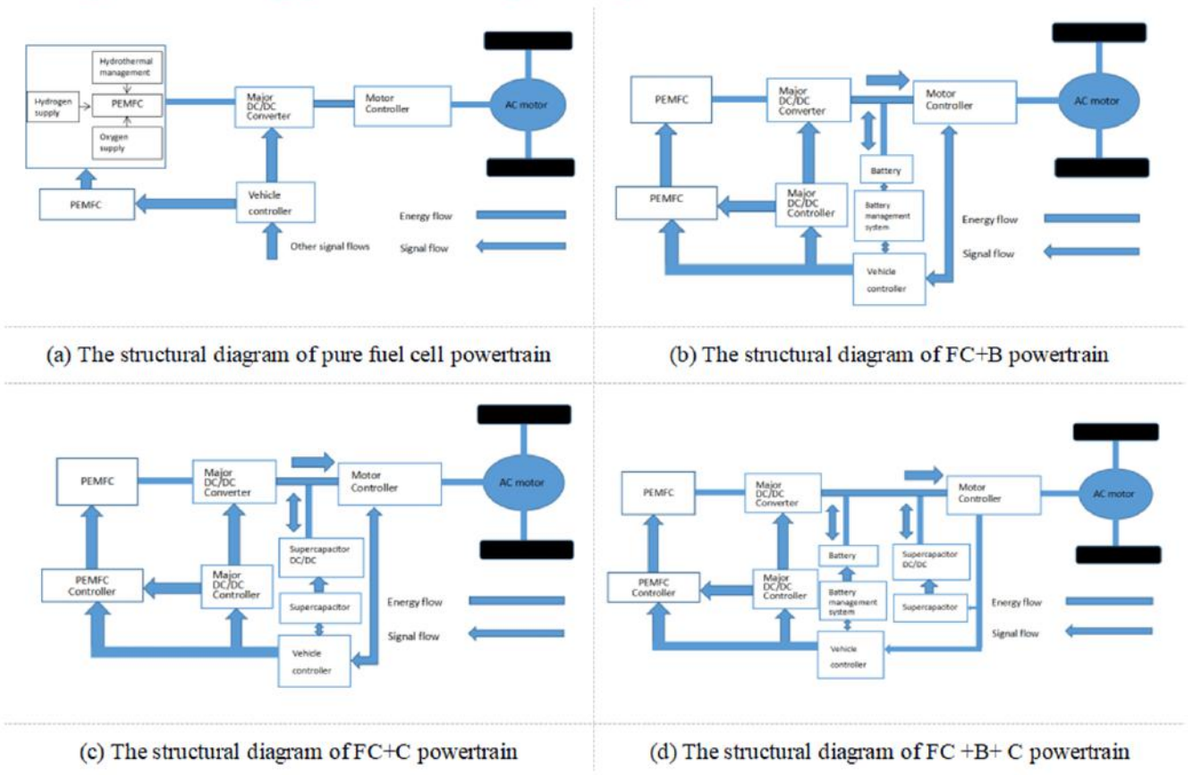
- Introduce the key components of fuel cell electric vehicle and their working principle;
- Analyze the future development direction of FCEV by comparing mainstream technology and advanced technology;
- Discusse the prospect of FCEVbased on relevant strategy and communication results.

PEMFC stack:



The so-called PEMFC stack is a stacked combination of a single cell consisting of a membrane electrode assembly (MEA), a gas diffusion layer, a bipolar plate and a sealed gasket.

Auxiliary energy storage system:



(a) The structural diagram of pure fuel cell powertrain

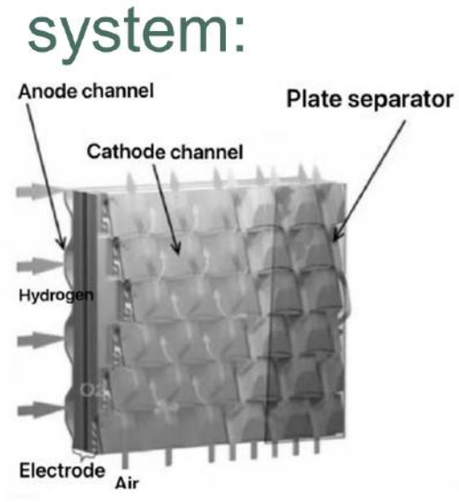
(b) The structural diagram of FC+B powertrain

(c) The structural diagram of FC+C powertrain

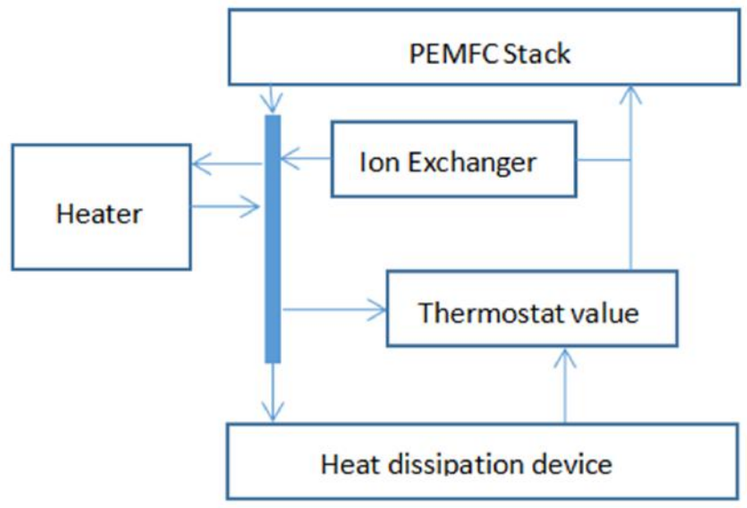
(d) The structural diagram of FC +B+ C powertrain

Most applications of fuel cell power systems in automobiles are hybrid power systems. The addition of auxiliary power supply can reduce the vehicle cost. In this way, the dynamic response of the fuel cell is less, and the fuel cell can work under its high efficiency.

Hydrothermal management system:



Self-humidifying technology uses 3D fine grid flow field on the cathode surface made of hydrophobic materials to improve the water removal rate.



The flow of air and hydrogen inside the battery is set to countercurrent, and the moist air provides the water needed for the power module. This is a more common system

Conclusion:

- The hydrogen power technology shows a relatively long industrial chain, a large technical field span and many technical bottlenecks.
- It is expected to see the rapid development of fuel cell electric vehicles in the next 10 to 30 years.

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