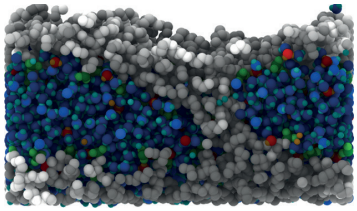
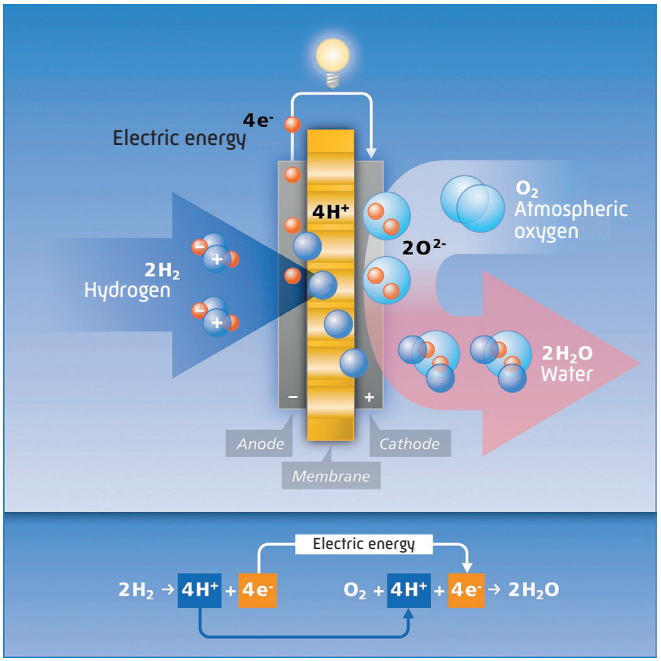
THE MYSTERIES OF A PLATINUM FILM

What is happening in the thin polymer layer of a fuel cell electrode? Physicists modeled this crucial issue and discovered that in this 5-nanometer thick film, water is distributed in an inhomogeneous way.



Simulation of a Nafion ultra-thin film in contact with a hydrophobic support. One observes the formation of water pools (blue), separated from the polymer matrix (gray) by the sulfonic groups interface (green).

The efficiency of a Proton Exchange Membrane Fuel Cell (PEMFC) is based in part on the ability of the platinum catalyst to separate the different elements, especially hydrogen and oxygen.
The platinum is located in the ultra-thin film between the carbon electrode and the polymer electrolyte. In a PEMFC, this layer with a complex structure is formed by pouring a mixture of platinum nanoparticles and carbon grains in contact with the polymer.
Its physico-chemical characteristics modify many electro-catalytic properties of the cell.



Based on statistical mechanics tools, researchers at INAC, in collaboration with the LITEN have numerically simulated the transport of water molecules through the ultra-thin film and observed the inhomogeneous formation of water "pools ". This model will advance the interpretation of experiments performed by neutron scattering and x-ray, and lead to optimization of this sensitive part of the battery.

Reference:
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DSM contact: Stefano Mossa (INAC)

A fuel cell is a cell where the production of electricity results from the oxidation of a reductive fuel on an electrode, such as hydrogen, coupled with the reduction on the other electrode of an oxidant, such as the oxygen in the air.