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CALIFORNIA DREAMING?

The widespread adoption of platinum-based fuel cell electric vehicles is slated to become a reality in the US state of California

California has recently set the most ambitious targets for the reduction in greenhouse gas emissions of anywhere in the world, with a commitment to becoming completely carbon neutral by 2045. A key part of achieving this goal will be the transformation of its transportation infrastructure away from a dependence on fossil fuels – a significant challenge given there are more than 24 million passenger cars registered in California.

Renowned for its progressive policies aimed at tackling climate change, California has had a head start towards carbon neutrality with its early push towards zero emission platinum-based fuel cell technology; over 5,000 platinum-based fuel cell electric vehicles (FCEVs) are on the road there already.

Combined with an existing network of around 40 hydrogen fuelling stations, FCEV motorists already have the freedom to travel along the Pacific Coast Highway between San Francisco and Los Angeles with total confidence.

FCEVs combine the emissions-free driving of battery electric vehicles with the quick refuelling times and range of a traditional gasoline or diesel car. Unlike battery electric vehicles, they also have the advantage of providing 'high load capacity', meaning that FCEVs maintain a consistent power output even as the load increases, for example when going uphill or towing.

In a platinum-based fuel cell, electricity is generated through an electrochemical reaction by combining hydrogen and oxygen, with heat and water as the only by-products. Molecules of hydrogen and oxygen react and combine using a proton exchange membrane (PEM) which is coated with a platinum catalyst, and there is no combustion.

Fuel cells share many of the characteristics of a battery (although without the weight) – silent operation, no moving parts and an electrochemical reaction to generate power. However, unlike a battery, fuel cells need no recharging and will run indefinitely when supplied with fuel. A fuel cell can have a smaller battery as a system component to store some of the electricity it is generating.

Platinum is especially suited as a fuel cell catalyst as it enables the hydrogen and oxygen reactions to take place at an optimal rate, while being stable enough to withstand the complex chemical environment within a fuel cell and high electrical current density, performing efficiently over the long-term.

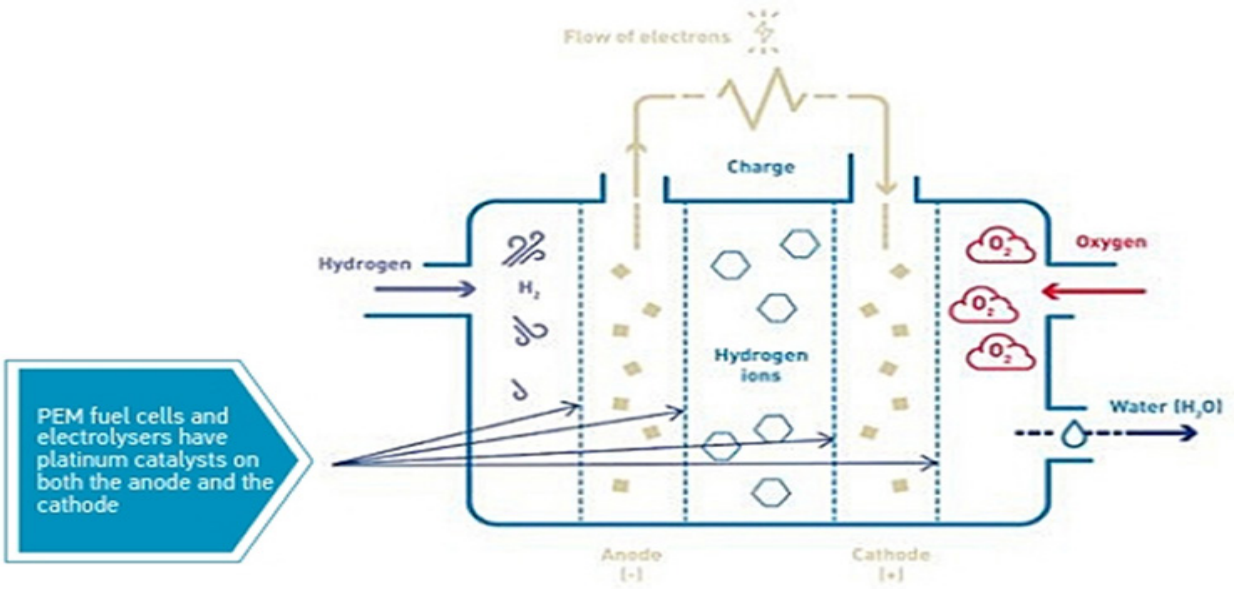
Focus on hydrogen refuelling build-out

The Californian vision of carbon neutrality is certainly no pipe dream, and the state is taking active steps to promote significant growth in its FCEV fleet, across both the heavy duty (trucks) and light duty (cars) segments.

One of the factors the state sees as being critical to FCEV roll-out is the availability of hydrogen refuelling stations, using hydrogen from renewable sources where possible – as it believes that this is the main factor that will influence consumers when it comes to considering alternatives to gasoline and diesel.

With this in mind, initiatives are underway in California to achieve a network of 1,000 hydrogen refuelling stations by 2030 to service the one million FCEVs it expects to have on its roads by then.

Inside a platinum-based fuel cell



Source: Graphic from Airliquide Proton Exchange Membrane

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