Evolution of the current density distribution in PEMFC during drying and wetting processes

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Polymer electrolyte membrane fuel cells (PEMFC) are expected to be an interesting alternative as power supply in portable, applications because of their high power density and low environmental impact. From the technical side, water management is one of the most important issues for the successful operation, performance and durability of the PEMFC.

Drying Processes

The same flow value is imposed for the anode and cathode. In these way, the water uptake of dry gasses is the same at both sides. Current density evolution plots, figure 1, show the reduction of the local current density (blue line), starting at the cathode inlet.

Wetting processes.

There are some differences in the cell response depending on the hydration of the cell compartment cathode or anode. The hydration of the cathode involve a faster cell response and an uniform surface activation in the cell, red line in figure 2, while the hydration of the anode produces a slower response, and the activation surface shows an activation front starting at the anode inlet, blue line figure 2.

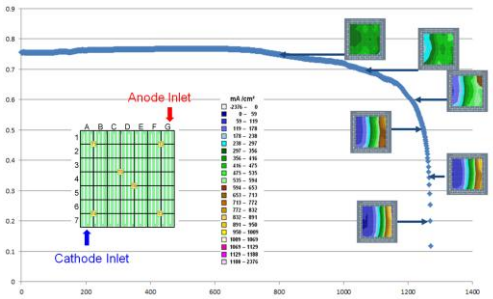

Figure 1: *Current densitiy evolution during drying process, 9.5 A constant current*

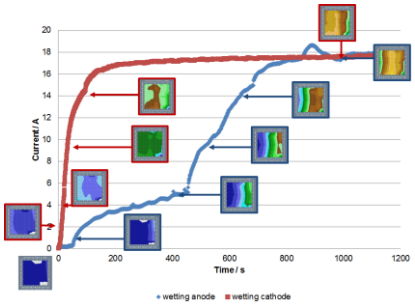

Figure 2: *Current density evolution during wetting process, 600 mV voltage constant.*