INVITED ORAL PRESENTATION

Stability challenges of anion-exchange membranes for electrochemical applications

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Amazing progress has been achieved in the past five years of intensive research on Anion-Exchange Membrane (AEM) Fuel Cells (AEMFCs) and Water Electrolyzers (AEMWEs), bringing the AEM-based technologies closer to the required levels for practical applications. In material-related space, recent studies reported novel techniques for characterizing AEMs [1] and robust AEMs with ultra-high hydroxide conductivities of 300 mS/cm [2]. In addition, new ionomeric materials and functional groups with increasing stability were introduced [3-5], and better Pt-free and PGM-free promising catalysts were developed [6-10]. On the fuel cells front, new AEMFCs based on critical raw materials (CRM)-free catalysts were successfully demonstrated [11-12], cells with record high power density outputs were obtained [13], materials able to operate under high-temperature AEMFC (HT-AEMFC) operation mode were first reported [14], simulated materials and conditions to achieve AEMFC lifetime of 5,000-15,000 hours were theoretically demonstrated for the first time [15-16], and cell lifetime of 2,000 hours of continuous operation was already experimentally proven [17]. Initial studies have just started in the water electrolyzer front, but the technology already showed outstanding results with a promising future [18]. Altogether, the research community has made impressive progress in such a short time. Having said that, we are not yet there; several remaining challenges should still be overcome to allow AEM-based technologies to be viable alternatives to mainstream PEM-based technologies. In this talk, I will present and discuss the current main challenge of AEMs – the lack of alkaline stability, and, if time allows, share our recent developments aiming to overcome this crucial challenge.

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