Células a Combustível de Membrana de Troca Aniônica de Alto Desempenho Baseadas em Ionômeros Sólidos

High Performance Anion Exchange Membrane Fuel Cells Based on Ionomers

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Abstract: Alkaline polymer electrolyte fuel cells (APEFC) have received increased attention in recent years as an alternative to well-established PEMFC because the alkaline medium enables more efficient and faster electrochemical reactions using non-noble catalysts. The development of stable and conductive polymeric materials employed as anion-exchange membranes (AEM) and anion-exchange ionomers (AEI) has been the focus of substantial efforts. In this work, ETFE (poly(ethylene-co-tetrafluoroethylene)) powders were electron-beamed radiation-grafted (RG) with vinylbenzyl chloride (VBC) monomer and then either aminated with trimethylammonium (TMA) or *N*-methylpyrrolidinium (MPY). The resulting powders were employed as the AEI in the gas diffusion electrodes in single cell H_2/O_2 APEFCs (along with RG-AEMs). The results showed that the degree of grafting (DoG), and consequently the ion-exchange capacity (IEC), are strongly dependent on the radiation dose. RG-AEI made from ETFE irradiated at 100 kGy (total absorbed dose) and functionalised with TMA (ETFE100TMA) and MPY (ETFE100MPY) exhibit IEC values of 2.05 and 1.91 meq.mol^{-1}, respectively. The H_2/O_2 power density curves (Fig. 1) for APEFC with ETFE100TMA in both anode and cathode; ETFE100MPY in both anode and cathode, and ETFE100TMA in anode and ETFE100MPY in cathode, revealed high performances (> 800 mW cm^{-2}). The best performance was observed for with the ETFE100TMA anode and ETFE100MPY cathode (maximum power density of 1.1 W.cm^{-2}).

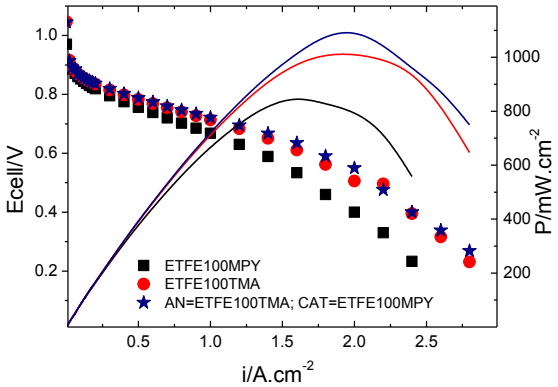

Fig 1. Beginning-of-life polarisation (symbols) and power density (lines) curves for electrodes containing ETFE100TMA and ETFE100MPY ionomers (25 wt%) at 60 °C: AEM = ETFE-MPY-type (50 µm when hydrated); Anode = PtRu/C (0.4 mg.cm^{-2}); Cathode = Pt/C (0.4 mg.cm^{-2})

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