

GO@SiO₂/HDPE Anion Exchange Membranes for Water Electrolysis

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Graphene oxide (GO) collects several promising properties for application in anion exchange membrane (AEM) for alkaline water electrolysis (AWE). Thus, besides promoting water uptake, graphene-based AEMs may present enhanced ionic conductivity and reduced fuel crossover. In this sense, this work proposes the production of novel ternary nanocomposites based on GO, SiO₂ and high-density polyethylene (HDPE) for AWE application. For this purpose, aqueous GO dispersions have been mixed with ethanolic SiO₂ dispersions in different m/m proportions, leading to GO@SiO₂_1:100 and 1:500 materials. In the following, these hybrids were extruded with HDPE, generating SiO₂@GO/HDPE_1:100 and 1:500 membranes. The films were irradiated in an electron accelerator at 50 kGy and grafted with vinylbenzyl-chloride monomer. The presence and homogeneity of GO and SiO₂ in the nanocomposites was attested by Raman spectroscopy and scanning electron microscopy. Tensile tests showed that the incorporation of GO improves the mechanical stability of the membranes. After amination with trimethylamine, they were applied for water electrolysis in KOH 1 mol L⁻¹ under 60°C. Preliminary results indicated satisfying performance, achieving a high current density of 2.1 A cm⁻² at 2.2 V, indicating that GO offers new possibilities to the development of AEMs.

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