Nitrogen doped graphene oxide derivative filler to improve the performance of novel polymer based nanocomposite membranes for a direct ethanol fuel cells

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"*NanoElMem*", a 3-year M-era.NET project, presents an innovative approach towards the design and fabrication of materials for the creation of direct alkaline ethanol fuel cells (DAEFC). Emphasis is put here on the development of platinum (Pt)-free anode catalysts and nano-composite membranes, where environmentally friendly and sustainable polysaccharides and inorganic materials is employed. The vast potential of graphene, from a scientific and applied point of view, is harnessed as an active component in polysaccharide-based nanocomposite membranes. Direct alkaline ethanol fuel cells have recently received increasing attention since in principle they allow for the use of non-precious metal catalysts, which dramatically reduces the cost per kilowatt of power in fuel cell devices [1]. The heart of a DAFC is an anion exchange membrane (AEM) formed by sandwiching a multi-layered structure (i.e. anode diffusion layer, anode catalyst layer and AEM) between an anode and a cathode. In this work, a series of novel nitrogen doped reduced graphene oxide derivatives (N-rGO) were successfully synthesized through thermal annealing of GO and Melamine as nitrogen precursor. The synthesized N-rGOs were blended with chitosan polymer in order to produce anion exchange composite membranes. To investigate their applicability in direct ethanol fuel cells, the membranes were characterized in terms of their structural properties, chemical and alkaline stability and ionic properties.

References

[1] Dekel D.R. Review of cell performance in anion exchange membrane fuel cells. J Power Sources. 2018;375(31):158-169.

Figures

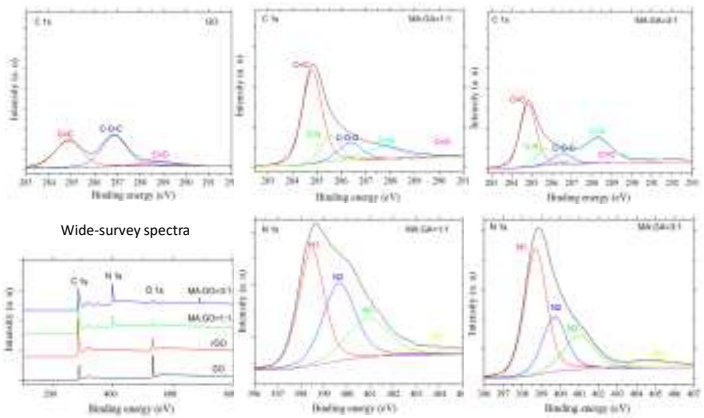

Figure 1: Wide-survey XPS spectra, C 1s and N 1S spectra of GO, rGO and heat treated MA:GA=1:1 and MA:GA=3:1.