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Dry weight capacity of polymeric ion exchange membranes by conductometric titration

Abstract:

The polymeric ion exchange membranes are essential components in applications related to energy and environment. Their use in different technologies such as reverse osmosis, electrodialysis, fuel cells, electrolyzers, and redox flow batteries, is an example. Therefore, knowing physical-mechanical properties such as exchange capacity, dry weight capacity, water content, thermal and chemical stability, as well as transport properties, is of foremost importance. The dry weight capacity of a material is defined as the total number of equivalents of exchangeable ions. To determine the value of this property, conductometry can be used, which is employed to analyze ionic species and to observe a chemical reaction by studying the electrolytic conductivity of the reactive species or the resulting products. In particular, conductometric titration is an analytical technique that through measurements of conductivity, allows establishing the equivalent point of a reaction, solution, and system. In practice, this technique consists of the addition of equal amounts of titrant with a burette and after each addition the conductivity is measured. The results permit to plot a graphical representation of conductivity as a function of the volume of titrant added. The graphical representation consists of two lines that intersect at the equivalent point and allows determining the dry weight capacity of the polymer material under study. The developed protocol for conducting conductometric titration will then be presented, which allows for reduced operation times and provides accurate results, as observed from the determinations performed with Nafion® 117 membrane.

Biography

Maria Jose Lavorante is the Head of Research and Development Division of Renewable Energy at the Institution of Scientific and Technological Research for Defense (CITEDEF), Buenos Aires Province, Argentina. Her research interests include water electrolyzers, fuel cells, dark fermentation and conductometric titrations. She is the Head Professor at the Engineer Faculty, at the National Defense University in charge of the subjects Inorganic and Organic Chemistry, Organic, Synthesis and Solids and Colloidal Chemistry. Since 2021, she is the coordinator of the "Electrolyzers for industrial use and storage" subnetwork of the CYTED network "Hydrogen: production and uses in transportation and the electrical sector (H2transel)".