

SUPER ACID-POLYMER NANOCOMPOSITES FOR FUEL CELL APPLICATIONS

¹*Adina Morozaan, F. Nastase, Anca Dumitru, C. Mirea, Iuliana Pasuk, Adriana Andronie,*
¹*Claudia Nastase, S. Vulpe, I. Stamatina*

¹Nano-SAE Research Centre, University of Bucharest, PO Box MG-38, 077125, Bucharest-Magurele, Romania

²National Institute of Materials Physics, PO Box MG-7, 077125, Bucharest-Magurele, Romania
adina.morozaan@gmail.com

Since S.M. Haile [1] shown performances reached with solid acids in fuel cells as proton conductor, researchers in field increased continuous. Solid proton conductors are receiving considerable attention, stimulated by the need of fuel cells optimization and pollution control [2, 3]. The key limitation to higher power output is fabrication of fuel cells containing thin electrolyte membranes with minimized ohmic losses [4].

In this work we report the synthesis and the properties of the proton-conducting nanocomposites based on solid acids embedded in a polymer matrix of polyvinylidene fluoride (PVDF). The polymer, with its good mechanical properties, served as a supporting matrix for the high proton conductivity inorganic phase. Emphasis is given to structural composites on the basis of complex solid acids built-up on nanometric oxide (YSZ – yttria-stabilized zirconia) structure with cesium hydrogen sulfate phosphate (CsHSO₄-CsH₂PO₄) systems. The conductivities of nanocomposite polymer electrolytes with improved transport properties are induced by physical and chemical characteristics at bulk and interface levels.

Structural and morphological characterizations were carried out by X-ray powder diffraction, SEM, FT-IR and Raman spectroscopy. The measurements of electrical conductivity, during heating and cooling with a rate of 2–3⁰C/min, were evaluated with a Keithley 2400 system. Obtained results provide a valid support for the enhancement of essential properties of solid fuel cell electrolytes.

References:

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