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Development of Graphite-Epoxy Composites for Bipolar Plates in PEM Fuel Cells

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Abstract

Graphite-Epoxy composites can be a good alternative to metals and metal alloys to build Bipolar Plates (BPs),1 that are important components of Proton Exchange Membrane Fuel Cells (PEMFC), mainly used in hydrogen-powered electric vehicles. We are currently working2 on the preparation of graphite-epoxy composites, suitable for manufacturing BPs meeting the technical targets for 2025.3

Among the overall properties expected for BPs, we are mainly focussing on conductivity, flexural strength and permeability and we are tuning the preparation steps, i.e. composite formulation, mixing and molding, trying to optimize these properties. We compared different resin to filler ratios, dry and wet mixing, mechanical and magnetic stirring and different temperature and pressure ranges. A two-level full factorial Design Of Experiment (DOE) approach was performed to analyze the molding parameters.

We observed substantial changes in the properties of the composites, depending on the type of graphite, the mixing method, the epoxy resin to filler ratio and the molding pressure, temperature and time. The results of these studies will be presented.

Keywords

PEM Fuel Cells; Bipolar Plates; Graphite-Epoxy composites.

References

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Biography

Prof. A. Mucci holds a Master Degree in Chemistry and a PhD in Chemical Science at the University of Modena and Reggio Emilia. She was a researcher in Organic Chemistry from 1992 to 2002 and has been Associate Professor of Organic Chemistry since 2002 at the University of Modena and Reggio Emilia. She works at the Department of Chemical and Geological Sciences of the University of Modena and Reggio Emilia. She published more than 140 papers on international scientific journals and she is co-author of more than 120 communications at national and international meetings.

Her research focuses on materials for energy applications; in particular, on semi-conductive organic materials (oligo- and polythiophenes) with applications in organic photovoltaics and in enhanced hydrogen production and on graphite-based conductive composites for bipolar plates for PEM fuel cells. She also studies complex biological or synthetic matrices applying nuclear magnetic resonance spectroscopy and other techniques.