Material Challenges in Proton Exchange Membrane Fuel Cells

B. Choudhury, G. Escobedo, K. Barton, D. Curtin, R. Perry
E.I. du Pont Nemours & Company, DuPont Fuel Cells, Chestnut Run Plaza, Wilmington, DE 19805

Fuel cells are generally considered as a clean, efficient and silent technology that can produce electricity and heat from fossil fuels, biofuels as well as hydrogen produced from renewable energy sources such as wind energy and solar energy. The expectations held since mid 1990s with respect to their commercial introduction in transport as early as 2003 and stationary applications by 2001 have yet to be realized. The main hurdles preventing commercial introduction continue to be high cost, lack of durability, high system complexity and a lack of fuel infrastructure.

Understanding and improving the chemical and mechanical durability of PEM fuel cells are key subjects of research and development in industrial, government and academic laboratories worldwide. Degradation of component materials, such as the membrane and membrane electrode assembly (MEA) under the demanding operational conditions in the PEM fuel cells is responsible for many failures observed in system tests.

DuPont has made significant progress in the development and improvement of perfluorosulfonic acid membranes, such as Nafion®, and MEAs for hydrogen and reformed hydrogen fuel cell applications. This talk will focus on the systematic approach taken by DuPont, and the progress in the development of durable membrane and MEAs to meet the lifetime objectives of the Fuel Cell industry.