Graphene-supported platinum catalysts for fuel cells

Increasing concerns with non-renewable energy sources drive research and development of sustainable energy technology. Fuel cells have become a central part in solving challenges associated with energy conversion. This review summarizes recent development of catalysts used for fuel cells over the past 15 years. It is focused on polymer electrolyte membrane fuel cells as an environmentally benign and feasible energy source. Graphene is used as a promising support material for Pt catalysts. It ensures high catalyst loading, good electrocatalysis and stability. Attention has been drawn to structural sensitivity of the catalysts, as well as polymetallic and nanostructured catalysts in order to improve the oxygen reduction reaction. Characterization methods including electrochemical, microscopic and spectroscopic techniques are summarized with an overview of the latest technological advances in the field. Future perspective is given in a form of Pt-free catalysts, such as microbial fuel cells for long-term development.