Water and charge transport models in proton exchange membranes: An overview

Abstract

Recently, the significant role of water management in affecting the performance and durability of proton exchange membrane fuel cell (PEMFC) has been subjective to an intensive research to understand water transport phenomena which is marked by two processes: water adsorption and water diffusion. Various mathematical models have been developed to address both processes on a different basis. This article briefly reviews various water transport models in a comparative manner to have a better understanding on the role of water hydration with respect to membrane structure and transport mechanism, in affecting the proton transport in the membranes. A discussion on the validity and reliability of the models for describing the water management is also presented. The limitations that are required to be overcome to design new materials meeting the new trends of membranes development for fuel cell are also highlighted.