Graphene-Related Researches for Promising Membrane Applications

Ho Bum Park

Department of Energy Engineering, Hanyang University, Seoul 04763, Korea

badtzhb@hanyang.ac.kr

Abstract: Nanomaterials have tremendous potential in a wide variety of membrane applications. Within the vast range of nanomaterials, there are many cases of dense and porous membranes with exceptional strength and tailored surface properties, which can be extremely light or thin. Currently, graphene-based membrane materials (e.g., nanoporous graphene, graphene oxide (GO), and graphene- or GO-embedded polymers) hold great promise for membrane-based gas separations. For the last decade, significant advances have been made on the development of graphene-based membranes for gas separation, liquid separation as well as proton-exchange membrane fuel cells via both a large number of theoretical studies and some proof-of-concept experiments. Theoretically, graphene-based membranes can afford remarkably high gas or water permeance and selectivity with notable mass-transport properties that may be not possible with state-of-the-art commercial polymeric, inorganic, and ceramic membranes. Prompted by these theoretical calculations, as well as the unique physical-chemical properties of graphene, many experimental approaches have been extensively explored to make these membranes a reality for practical processes. In this paper, the latest achievements on both theoretical and experimental studies of graphene-based membranes are discussed in relation to gas separation and water purification applications, and the research strategy for reality from lab-scale would be introduced with some examples.

Short Biography: Ho Bum Park is a Professor at the Department of Energy Engineering, Hanyang University, Seoul, Korea. He obtained his BSc, MSc and PhD from Hanyang University, Seoul in 1996, 1998, and 2002 respectively. In 2005-2007, he worked at the University of Texas at Austin. His research, covering many years, is on the design and development of new advanced membrane materials for gas and liquid separation technology and environmental green energy applications such as fuel cells.