Interlocking interfaces: bi-layered membrane for polymer electrolyte fuel cells and redox flow batteries

김희탁†, 육성민, 김수현
한국과학기술원
(heetak.kim@kaist.ac.kr†)

Physically interlocked interface of two incompatible polymeric membranes provides a means to combine two different functions for advanced energy devices. Recently, we invented a highly interlocked interface by combining spray coating, extraction and dip coating processes. The physically interlocked membranes show a strong interfacial binding which can withstand an internal stress under wet expansion. More interestingly, ion transport across the interlocking interface is not hindered, indicating that a molecular scale intimate contact is achieved. In this talk, two case studies on the interlocking interface are presented. The first example is a bi-layered membrane of a cost-effective hydrocarbon membrane and a thin perfluorinated ionomer for enhancing the durability of polymer electrolyte fuel cells. The other one is a bi-layered membrane of a hydrocarbon membrane and a perfluorinated ionomber-based protection layer for improving chemical stability of vanadium redox flow batteries. These studies demonstrate that the introduction of thin perfluorinated ionomer layer with a help of the interlocking interface improves some poor properties of the hydrocarbon membrane.