

Nafion-Carbon Quantum dots (Nafion-CQDs) composite membrane for vanadium redox flow battery systems

정다습^{1,2}, 김성천^{3,2}, 조철현², 윤대회², 임성남², 황해진¹, 최시영³, 박제성^{2,†}

¹인하대학교; ²한국생산기술연구원(KITECH); ³한국과학기술원(KAIST)

(jpark@kitech.re.kr[†])

Vanadium redox flow battery (VRFB), a type of energy storage system (ESS), can be designed easily and is excellent in terms of lifespan and stability. VRFB membrane is considered high hydrogen ion conductivity, low vanadium ion permeability and high stability in acidic solutions. Fluorine-based Nafion membrane, manufactured by Dupont, has excellent stability in acidic solutions, but lifespan is reduced due to high vanadium ion permeation. In order to improve above disadvantage, this study utilized a Nafion-CQDs composite membrane prepared by carbon quantum dots (CQDs) with an eco-friendly hydrothermal synthesis method. Carbon quantum dots composed of nano-sized particles have abundant functional groups, which not only enhances hydrogen ion conduction, but also prevents penetration of vanadium ions as a barrier to maintain a long lifespan. Therefore, Nafion-CQDs membrane was significantly improved from 72% (present Nafion membrane) to 86%.