

Development of metal catalysts for efficient water-splitting of bipolar membranes

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In this study, metal catalysts have been developed for the efficient water-splitting of bipolar membranes (BPMs). The BPMs were prepared by casting sulfonated poly(ether ether ketone) (SPEEK) on an anion-exchange membrane which is fabricated by filling a styrene-based ionomer into a porous substrate film. Several metal compounds such as Fe(OH)₃, Fe-EDTA/NaOH, Fe₂O₃@ZIF-8 were examined as the catalysts for facilitating water-splitting in BPMs. In addition, the dispersion properties of the metal catalysts were improved by optimizing the solvent composition in the solution and the catalysts could be quantitatively loaded at the bipolar junction through spray coating. Membrane characterizations and water-splitting electro dialysis experiments were conducted to determine the optimum metal catalyst and loading amount. As a result, it was confirmed that the BPM prepared under the optimum conditions showed better water-splitting flux than that of the commercial BPM (BP-1E, Astom). This work was supported in part by the MOTIE (No. 10047796) and the MOE (No.2017000140002/ RE201702218).