Atomically Dispersed Pt Catalysts for Enhancing Electrochemical Chlorine Evolution Reaction

임태정, 주상훈†
UNIST
(shjoo@unist.ac.kr†)

Electrochemical chlorine evolution reaction (CER, $2\ Cl^- + 2\ e^- \rightarrow Cl_2$) plays a pivotal role in a chlor-alkali process. The class of metal- and nitrogen-cooped carbon (M-N/C) catalysts comprising atomically dispersed $M-N_X$ sites has been studied for many important electrocatalytic reactions, such as hydrogen evolution reaction (HER) and oxygen reduction reaction (ORR). However, to the best of our knowledge, the M-N/C catalysts have never been exploited as an active catalyst for the CER. In this work, we report a platinum- and nitrogen-codoped carbon nanotube (Pt-N/CNT) catalyst with high CER activity in acidic media, which allows for minimizing the usage of expensive Pt. The Pt-N/CNT catalysts exhibited a onset potential (~30 mV) and ca. 6 times higher mass activity for CER than those of Pt nanoparticles supported on CNT (PtNP/CNT) catalyst in 1.0 M NaCl electrolyte (pH ~1). The CER on the Pt-N/CNT catalyst followed the Volmer-Heyrovsky mechanism, as revealed by Tafel analysis. Furthermore, we also found that the activity of the Pt-N/CNT catalysts for the CER was dependent on the heat-treatment temperatures, with the sample treated at 700 ℃ showing the best performances.