Cellulose-induced high surface coverage metal nanoparticle generation by the carbothermal shock for electrocatalytic CO2 reduction

송지윤[1,2], 김찬솔[1], 정현수[2], 정희태[1,†]
[1]KAIST; [2]KIST
(heetae@kaist.ac.kr[†])

Metal nanoparticles (NPs) have gained broad interest in various applications. The carbothermal shock (CTS) method has attracted considerable attention in recent years for the formation of finely controlled single to poly-elemental alloy NPs with facile and fast synthesis. However, formation of high surface coverage NPs with minimized exposure of carbon substrate has not been realized yet in the CTS method. Therefore, expansion of CTS method to various potential electrochemical applications.

By introducing cellulose as the carbon substrate, we synthesized high surface coverage over 85% of various single and poly-elemental NPs. Additionally, we figured out that the mechanism of NPs formation with the high surface density is strongly related to the change of the chemical state of the cellulose. The application field of the CTS method was expanded to electrocatalytic CO_2RR for the first time by achieving high surface coverage of Cu NPs. High surface coverage of NPs and minimized exposure of carbon support facilitated CO_2RR with suppression of serious competitive hydrogen evolution and unwanted reactions.