Boosting Charge Separation in WO3 with Balanced Oxygen Vacancy for Efficient Hydrogen Production

Jin Bingjun, Ping Li[1], Jie Jin[1], 박종혁[1,†]
Yonsei University; [1]연세대학교 화공생명공학과
(lutts@yonsei.ac.kr[†])

Suppressing charge recombination at the electrode/electrolyte surface is considered a crucial strategy to improve photoelectrochemical (PEC) water oxidation. On the basis of great successful on passivation layer, we put forward an innovative design on targeting possible recombination center of a disordered overlayer to further improve the effectiveness of passivation layer. A 3 nm thick disorder overlayer in-situ formed on WO3 photoanode, which contains excessive oxygen vacancies, was repaired by oxygen-rich carbon nitride quantum dots (CNQDs). In such a way, the surficial defect repair for the disordered passivation layer dramatically improve the PEC performance, including a 1.5-fold photocurrent density and a 100 mV cathodic onset potential shift to disorder overlayer. Moreover, investigations on charge transfer and transport efficiencies of the DL-WO3/CNQDs photoanode clearly demonstrate the dominated role of charge transfer, suggesting that the surficial defect repair mainly accounts for charge recombination at the electrode/electrolyte interface.