High efficiency photoelectrochemical CO$_2$ to CO reduction by high transparency Au pattern

김예솔, 정우빈, 정희태[†]

KAIST

(heetae@kaist.ac.kr[†])

Carbon dioxide reduction is promising technology for future due to decreasing greenhouse effect. Among various reaction, reduction to carbon monoxide is important because it can further reduced to oxygenates and hydrocarbon.

Among various type of catalysts, photoelectrochemical catalyst is remarkable because it can get high efficiency using solar energy. To transfer solar light to semiconductor substrate, researchers use particle catalyst or synthesis hole at film catalyst or thin film catalyst.

We approach to make high efficiency PEC by 3D patterning. 3D patterned catalyst not only transfer light to substrate well also remove dead area of catalyst. We synthesis catalyst using gold. Because gold is known as high selectivity to convert CO2 to CO due to low CO binding affinity. Our pattern has high aspect ratio and high resolution, so surface-to-volume ratio is high. Moreover, pattern made by Ar bombardment, therefore it has small grain size approximately 5nm. Small grain size of gold increase CO2 conversion efficiency because of lots of grain boundaries.