Indium decorated nanoporous Ag as an efficient catalyst for enhanced CO2 electroreduction

Abstract;
Development of bimetallic nanoporous structures is of great importance for their energy and environmental applications due to their superior catalytic properties resulting from their higher surface-to-volume ratio, excellent surface reaction sites, as well as numerously rich microstructural properties. Herein, indium-modified nanoporous silver (np-Ag-In) was prepared by alloying-dealloying technique. The microstructure of the sample before and after the reaction was characterized by scanning electron microscope (SEM), energy dispersive x-ray spectroscopy (EDS), x-ray photoelectron spectroscopy (XPS) and transmission electron microscope (TEM).
The XPS spectra showed a shift of d-band centers in Ag–In which could enhance the catalytic activity. Besides, Faraday efficiency of np-Ag-In to generate CO reached ~94% at −0.8 V vs. RHE, while the geometric current density (j_{tot}) was as high as 15mA/cm^2, which is 21% higher than that of np-Ag (12.3mA/cm^2). The improved catalytic performance could be attributed to the synergistic effects through tuning of properties and surface composition restructuring. This work sheds light into the relationship between the fine structure of the surface and the electrocatalytic performance in CO_2 reduction.

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