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Selective oxidation of CO in H_2 stream on nano Au catalyst supported on $CuO\text{-}CeO_2$

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Abstract

Nanoscaled gold particle supported on CeO_2 and modified by CuO was used for selective oxidation of carbon monoxide in hydrogen stream (PROX). CuO-modified CeO_2 support was prepared by co-precipitaion method. Gold was loaded on the support by deposition-precipitation method. These catalysts were characterized by X-ray diffraction, N_2-sorption, TEM, HR-TEM, and XPS to gain the structural information. The PROX reaction was carried out in a fixed bed continuous flow reactor with a feed of CO: O_2: H_2: He = 1.33: 1.33: 65.33: 32.01 in volume ratios. CO/O_2 ratio was fixed at 1. The recation was caried out between ambient temperature and 100 ^oC with GHSV of 30.000 h^{-1}. The particle size of gold was around 2-5 nm and Au particles were dispersed well on the support. The results showed that the catalyst with specific Cu content and calcination temperature could reach 100% of CO conversion at the PEM fuel cells operating temperature (65 ^oC-100 ^oC) even as the gold content was reduced from 1 wt. % to 0.5 wt. %. The incorporation of copper ion into ceria lattice promoted the oxygen storage capacity of ceria support and enhanced the activity of catalysts. The higher calcinations temperature for the support resulted higher crystallinity of CeO_2, leading to the higher activity. The CO selectivity increased with increasing copper content. The catalyst with CuO content of 20% demonstrated the highest activity and selctivity for CO oxidation and suppress H_2 oxidation at 100 ^oC.