

Effect of hydrogen in promoting the activity of commercial three-way catalyst

백준현, 권용탁, 권혁재, 남인식*, 오세혁¹
포항공과대학교; ¹General Motors R&D Center
(isnam@postech.ac.kr*)

The presence of hydrogen in the feed stream enhanced the activity of the commercial three-way catalyst (TWC) employed in the present study. In order to identify the role of hydrogen, the in-situ FTIR analysis has been systematically examined and then the reaction mechanism has been confirmed in view of microkinetics. Hydrogen promoted the oxidation activity of CO at low reaction temperatures via the reaction between adsorbed CO and OH ($\text{CO}\bullet\text{S} + 2\text{OH}\bullet\text{S} \rightarrow \text{CO}_2 + \text{H}_2\text{O} + 3\text{S}$). In addition, hydrogen also assisted the NO dissociation reaction ($\text{NO}\bullet\text{S} + \text{H}\bullet\text{S} \rightarrow \text{N}\bullet\text{S} + \text{OH}\bullet\text{S}$). These two reaction steps play an essential role in enhancing the TWC activity by decreasing the self-poisoning of CO and the inhibition effect of NO. Based upon the reaction mechanism confirmed by FTIR analysis, the kinetic study was also performed to quantify the H_2 enhancement effect on the TWC activity.