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INVESTIGATION OF CARBON MONOXIDE (CO) OXIDATION PROCESS FOR CONVERTING ^{13}CO TO $^{13}\text{CO}_2$

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Abstract

Considering that $^{13}\text{CO}_2$ is an appropriate precursor material in ^{13}C labelling of various organic, inorganic and biological molecules, in this study the CO oxidation reaction is investigated for convert ^{13}CO to $^{13}\text{CO}_2$. CO oxidation was performed in a plug flow reactor over three $\text{Ni}/\text{Al}_2\text{O}_3$ catalysts (Ni loadings of 5 wt.%, 7 wt.%, and 10 wt.%) prepared by the wet impregnation method. $\text{Ni}/\text{Al}_2\text{O}_3$ catalysts present excellent catalytic activity in CO oxidation: catalytic performance improves with rising reaction temperature and with increasing metal loading. Among the investigated Ni catalysts, 7 wt.% $\text{Ni}/\text{Al}_2\text{O}_3$ is considered the most promising candidate for CO oxidation due to the wide temperature range for catalytic performance, as well as the best distribution of the smallest Ni nanoparticles, and the best metal dispersion corresponding to a very good metal surface area. Also, 7 wt.% $\text{Ni}/\text{Al}_2\text{O}_3$ was stable over 30 h time-on-stream with a mean CO conversion value of 90% at 250 °C. The good catalytic activity of this catalyst was validated in ^{13}CO total conversion to $^{13}\text{CO}_2$.

Key words: ^{13}CO conversion, CO catalytic oxidation, kinetic studies, $\text{Ni}/\text{Al}_2\text{O}_3$ catalysts, wet impregnation method

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