

Low-temperature oxidation of CO over $\text{CoO}_x/\text{TiO}_2$ catalysts for HCCI and fuel cell vehicle applications

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A TiO_2 -supported CoO_x catalyst with 5 wt% Co has been used for CO oxidation at low temperatures, such as 50 and 100°C, under a net oxidizing condition, and samples of the catalyst have been characterized using TPD, XPS and XRD measurements. The catalyst after calcination at 450°C gave highest activity for this CO oxidation, and XPS measurements yielded that a 780.2-eV Co $2p_{3/2}$ main peak appeared with this sample and this binding energy was similar to that measured with pure Co_3O_4 . After calcination at 570°C, the catalyst, which had possessed practically no activity in the oxidation reaction, gave a Co $2p_{3/2}$ main structure peak at 781.3 eV which was very similar to those obtained for synthesized $\text{Co}_n\text{TiO}_{n+2}$ compounds, and this catalyst sample had relatively negligible CO chemisorption as observed by TPD spectra. XRD peaks indicating only the formation of Co_3O_4 particles on titania surface were developed in the catalyst samples after calcination at temperatures $\geq 350^\circ\text{C}$. Based on these characterization results, five types of Co species could be modeled to exist with the catalyst calcined at different temperatures.