Exploring the role of Fe-C-Al sites for the low temperature CO oxidation over Fe-oxide/Al_2O_3 via ToF-SIMS

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Development of low temperature operating catalysts has been one of the challenges in exhaust gas catalysis since the most commonly used Pt-group catalysts are generally active above 150 ºC causing 'cold-start emission'. Fe-oxide nanoparticle catalysts have been studied extensively due to their high low-temperature activity and thermal stability, and many experimental/theoretical studies have been conducted to unveil the relationship between the structure and activity of the Fe-oxide nanocatalysts. In the present work, ToF-SIMS technique, which has not been used widely on iron oxide nanocatalysts, was utilized to elucidate the structure-activity relations on Fe-oxide/Al_2O_3 for the low temperature (~50 ºC) CO oxidation. The combined results of various surface analyzing tools including ToF-SIMS showed a scaling relationship of ternary interfacial sites of Fe-C-Al with the CO oxidation activity below 50 ºC, indicating that the Fe-C-Al species facilitate low temperature CO oxidation. This work shows that ToF-SIMS can provide valuable information on the structure-activity relations in heterogenous catalysts.

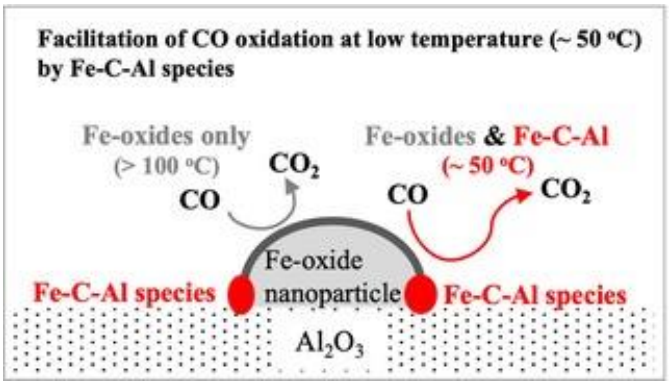

Figure 1. The Fe-C-Al species on the supported Fe-oxide nanoparticle catalyst facilitate CO oxidation at low temperature (~50 ºC)

References

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