Application of Simultaneous Thermal Analysis methods for investigating Exhaust Gas Aftertreatment Catalysts

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Meeting the strict legislation for exhaust gas emissions has become a challenge in catalyst development. An optimal aftertreatment catalyst for mobile applications should: (a) work over a broad temperature range in a dynamic gas mixture, (b) maintain high efficiency over its lifetime and (c) have a reduced cost. To achieve these objectives a comprehensive understanding of the processes occurring on the surface and in the bulk material during catalyst operation is required. This allows a rational design of improved catalyst formulations.

In this regard, thermal analysis methods combined with evolved gas analysis represent a valuable toolbox for material characterization, understanding the catalytic reactions and catalyst deactivation mechanisms. Our results on different NOx-removal and CO/HCs/soot oxidation catalysts demonstrate the ability of STA to uncover essential surface properties (catalyst acidity/basicity), quantify the redox activity, monitor catalytic reactions and to elucidate catalyst deactivation/reactivation processes.