# Characterization of Lanthanum Oxide on the Thermal Stability of Gamma Alumina Catalyst Supports

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**ABSTRACT**

A study for the synthesis and stabilization alumina by lanthanum oxide for the preparation of pure compounds to be applied to the research and development of new materials, especially catalyst, was developed.

The work has two parts. In the first one lanthanum oxide was prepared and chemically characterized. In the second part the synthesis of alumina, in the shape of microspheres were prepared by the sol-gel process.

Transition alumina, especially γ-alumina, is extensively used as washcoat of automotive catalyst because it can provide a high surface area for dispersion of the active phase. However, high reaction at temperature above 1000°C will result in gradual sintering and transformation of γ-alumina into α-alumina, which will in turn result in the decrease of surface area of alumina and the sintering of the active phase. The addition of lanthanum oxide to alumina is known to retard the surface area loss and to raise the transformation temperature of alumina from γ to α.

The influence of 0-5mol% lanthanum oxide on the thermal stability of gamma alumina catalyst supports was investigated. Sinter tests in air between 600°C and 1100°C show that sintering of γ-alumina proceeds via surface diffusion. In temperature the 1100°C the alumina sintering inhibition effect was reached successfully. It was observed experimentally that the addition the 2 mol% lanthanum inhibited the transformation of γ-alumina to α-alumina and the correspondent sintering associated to this transformation.

The highly dispersed lanthanum oxide and the formation of $LaAlO_3$ by solid-state interaction at the interface between $Al_2O_3$ and $La_2O_3$ are responsible for the stabilization of gamma-alumina. The addition of lanthanum oxide can prevent not only the sintering of γ - $Al_2O_3$, but also the phase transformation of γ to α from the loss of surface area of aluminas due to high temperature heating. XRD patterns indicate that lanthanum modification retards dramatically the α -phase transformation is consistent with the retardation of the surface area loss.