

Influence of composition on the thermal stability of ceria-zirconia mixed oxides

Michèle Pijolat, Gerardo Colon, Kester Kenevey, Françoise Valdivieso, Michel Soustelle, Richard Baker, Serafin Bernal

► **To cite this version:**

Michèle Pijolat, Gerardo Colon, Kester Kenevey, Françoise Valdivieso, Michel Soustelle, et al.. Influence of composition on the thermal stability of ceria-zirconia mixed oxides. F. Solymosi, J. Raskó. 14th International Symposium on the Reactivity of Solids, Budapest, 27 au 31 août 2000, Aug 2000, Budapest, Hungary. North Holland, 2001. <emse-00720721>

HAL Id: emse-00720721

<https://hal-emse.ccsd.cnrs.fr/emse-00720721>

Submitted on 25 Jul 2012

HAL is a multi-disciplinary open access archive for the deposit and dissemination of scientific research documents, whether they are published or not. The documents may come from teaching and research institutions in France or abroad, or from public or private research centers.

L'archive ouverte pluridisciplinaire **HAL**, est destinée au dépôt et à la diffusion de documents scientifiques de niveau recherche, publiés ou non, émanant des établissements d'enseignement et de recherche français ou étrangers, des laboratoires publics ou privés.

→ ISRS (XIVth), Budapest 2000.

INFLUENCE OF COMPOSITION ON THE THERMAL STABILITY OF CERIA-ZIRCONIA MIXED OXIDES

M. Pijolat, G. Colon, K. Kenevey, F. Valdivieso, M. Soustelle, R. Baker[§], S. Bernal[§]

Laboratoire de Procédés des Milieux Granulaires URA 2021 CNRS, Centre SPIN,
Ecole nationale supérieure des mines de Saint-Etienne, 158 cours Fauriel
42023 Saint-Etienne Cedex (France)
Fax : 33 (0)4 77 42 00 00, E-mail: mpijolat@emse.fr

[§] Departamento de Ciencia de Materiales, Ingeniería Metalúrgica y Química Inorgánica. Facultad de Ciencias, Universidad de Cádiz. Apdo. 40, Puerto Real
11510 Cádiz (Spain)

Ceria-zirconia mixed oxides are essential components in the three-way catalytic converters for automotive exhaust gas treatment and they must offer a good thermal stability in severe operating conditions. It is thus important to have a precise knowledge of the influence of the composition of the mixed oxide on the textural and structural properties of the catalytic materials. The behaviour of ceria-zirconia high surface area materials of nominal composition between CeO_2 and $\text{Ce}_{0.50}\text{Zr}_{0.50}\text{O}_2$, either bare or loaded with low (<1% wt/wt) amounts of noble metals, palladium and platinum, was studied under oxidising conditions at 950°C. Calcination treatments were carried out under controlled oxidising atmosphere for periods of up to 96 hours. Powder X-ray diffraction and BET surface area data are reported.

A maximum in the kinetic rate of surface area decrease is observed for the composition $\text{Ce}_{0.80}\text{Zr}_{0.20}\text{O}_2$ for which the initial fluorite structure remains unchanged during all the thermal treatment. Phase demixing is observed as sintering progresses for $\text{Ce}_{0.68}\text{Zr}_{0.32}\text{O}_2$ and $\text{Ce}_{0.50}\text{Zr}_{0.50}\text{O}_2$ with some differences regarding the composition of the new phases, or the presence of the noble metals. The results are discussed from a thermodynamic viewpoint, which puts in evidence the important contribution of surface energy to the stability domain of the mixed oxides.