

SYNTHESIS AND CHARACTERIZATION OF METASTABLE Zr-Al OXIDES

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The binary oxides of Zr and Al, with a wide range of Zr/Al ratios, were prepared by the sol-gel technique. The xerogels were annealed for 3h at temperatures ranging from 300 to 1500°C. Regardless of the known equilibrium phase diagram of the ZrO₂-Al₂O₃ system, which shows an eutectic with negligible solubility between the oxides, a large range of solid solutions was found in the zirconia-rich region, forming single amorphous, tetragonal and cubic phases. The cell parameters of the crystalline phases vary with composition.

In order to determine the exact metallic element content of a xerogel, each batch was treated for 3h at 1500°C. At this temperature the alumina and zirconia separated and the X-ray quantitative diffractometry results were used for the determination of the exact Zr/Al ratio. Finally a histogram of the phases as function of composition and annealing temperature was obtained. The crystal data were analyzed by the Rietveld refinement. Some samples were analyzed by neutron diffraction.