

# **Spectro-thermal characterization of the nature of sulfate groups immobilized on tetragonal zirconium oxide: Consequences of doping the oxide with Al or Mg cations**

## **Abstract**

The present investigation was designed to characterize influence of doping with Al or Mg ions on nature and acidity of sulfate species dispersed on tetragonal-zirconia. Pure and doped zirconias were prepared by the citrate method. Sulfating of the thus produced zirconias was carried out by impregnation with aqueous solutions of  $(\text{NH}_4)_2\text{SO}_4$ . The material bulk structure was elucidated by X-ray powder diffractometry and Laser Raman spectroscopy, whereas the surface sulfate was characterized via thermal and mass spectrometric analyses, and Fourier-transform infrared spectroscopy. The sulfate acidity was probed by IR  $\nu\text{CCN}$  spectra of adsorbed pyridine, and TPD of adsorbed n-propylamine. Results obtained showed the Al-doping to improve sulfate monolayer at the expense of overlayer structure, as well as its acidity. In contrast, Mg-doping influenced favorable bonding sites for polydentate sulfate of high thermal stability but of insignificant acidity.