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SILICA – ZIRCONIA MIXED OXIDE MODIFIED BY ANTIMONY (V) OXIDE: PRAPARATION, PROPERTIES AND APLICATION

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Most mixed-metal oxides have silica as a matrix. This e ures high surface area and prevents crystallization. The ma method to obtain non-crystalline mixed-metal oxides is sol-g technology. Recently we developed sol-gel technology for prepar tion silicon-zirconium oxide where zirconium contents can l changed in wide range. The important feature of the oxides obtain s its high degree of homogeneity. This type of materials can l useful in heterogeneous catalysis (petrol chemistry) since conta both Lewis (O_3-Zr^+) and Bronsted (Si-OH) centers of acidity. As can be seen from the formula Bronsted sites of acidity for silico zirconium oxide is quite weak and can not be used for example in such important application as alkane isomerisation. In order increase Bronsted acidity of the composition we performed surfa modification of the mixed-oxide with $SbCl_5$. It should be mention that sol-gel technology unlikely gives positive result since gre difference in components acidity. Moreover had the gel contai antimony in matrix volume, its hydrolytic stability should be low, contrast to zirconium that increase stability of the gel in acid. Sit for metal (such as Sr) adsorption and proton conductivity are oth important feature of the gel was expected to increase after its su face modification with $SbCl_5$. Mixed-oxide surface modificati with $SbCl_5$ with further hydrolysis will lead to compounds wi similar structure and probably similar adsorption properties.

In this respect a new high surface area Silicon – Zirconium mixed-oxide was obtained and then it surface was chemically modified with Antimony oxide (V). The resulting composite can be abbreviated as $(SiO_2/ZrO_2)Sb_2O_5$, where brackets indicate that SiO_2/ZrO_2 mixed-oxide was obtained by sol-gel technology and so it is volume-modified materials. In contrast Sb_2O_5 located on the composite surface due preparation procedure.

Obtained $(SiO_2/ZrO_2)Sb_2O_5$ was analyzed with chemical analysis. The ICP analysis was performed. Several methods have been developed to analyze of nitrogen gas adsorption isotherm for silica-zirconium mixed oxides with surface bonded antimony (V). All materials showed a Langmuir Type I isotherms indicating that the mixed oxides obtained are microporous. The specific surface areas, between 649 and 276 $m^2.g^{-1}$, and average pores diameter, between 0.64 and 0.78 nm, were obtained. The internal surface areas of $SiO_2/ZrO_2/Sb_2O_5$ mixed oxides are increased compared to initial SiO_2/ZrO_2 oxides and come to 460-300 $m^2.g^{-1}$. The pore size distribution indicated that the contribution of ultramicropores to the micropore volume of the material obtained is significant. The scanning electron microscopy images and the elements mapping showed that in every case, within the magnification used, zirconium and antimony were homogeneously dispersed in the matrices. Using pyridine as probe molecule, both samples, SiO_2/ZrO_2 and $SiO_2/ZrO_2/Sb_2O_5$, presented thermally very stable Brønsted acid sites. The ion exchange capacities were determined for Li^+, Na^+ and K^+ ions. For SiO_2/ZrO_2 samples the adsorption capacities were dependent on the nature of the cations, being higher in the order $K^+ > Na^+ > K^+$, while for $SiO_2/ZrO_2/Sb_2O_5$ in comparison with SiO_2/ZrO_2, the adsorption capacities were smaller and were independent of the cations nature. $SiO_2/ZrO_2(1)/Sb_2O_5$ with bonded Methylene Blue can be effective in order to developed new sensors for analytical application.