Performance of Vanadia-Titania Xerogels in the Selective Catalytic Oxidation of H_2S

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V_2O_5-TiO_2 catalysts with V_2O_5 contents ranging from 6 to 18 wt% were obtained by calcination at 773 K of xerogels prepared by a nonhydrolytic sol–gel route from $VOCl_3$, $TiCl_4$, and $^iPr_2O$. These materials were characterized by X-ray diffraction, micro-FT-Raman spectroscopy, static 51V NMR, SEM, N_2 physisorption, temperature-programmed desorption of ammonia (NH_3-TPD), and temperature-programmed reduction by H_2 (H_2-TPR). In all cases mesoporous solids were obtained with specific surface areas up to 87 m^2 g^{-1}. Up to a critical V_2O_5 loading (between 10 and 12 wt%), all the vanadium was highly dispersed in the form of monomeric vanadyl and polymeric vanadate species, whereas for higher loadings V_2O_5 crystallites also formed. The catalytic properties of these materials were evaluated in the selective catalytic oxidation of H_2S. The conversion of H_2S was over 92% at 220-300℃ with the reactant composition of $H_2S/O_2/H_2O/He$ = 5/2.5/20/72.5 and GHSV = 30,000 h^{-1}. The yield of solid products, ammonium thiosulfate and elemental sulfur was close to 100%, and there was no considerable amount of SO_2 emission.