Modifications of surface compositions in an on-site-used V_2O_5-WO_3/TiO_2 catalyst for lowering N_2O formation in the reduction of NO by NH_3

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This study has been focused on N_2O formation upon changes in surface compositions in an on-site-used V_2O_5-WO_3/TiO_2 catalyst using acid washing and active component addition techniques. The catalyst after on-site-use in a power plant showed decrease in surface area, and a shift of pore size distribution toward larger size. Vanadium amounts in the spent catalyst increased by 1%, and the vanadium oxide existed in the form of polycrystalline nanoparticles. The indicated changes in the physicochemical properties before and after on-site-use could lead to the noticeable difference in the N_2O production in the NH_3-SCR reaction. An acid washing of the used sample yielded N_2O production similar to that of a fresh catalyst, while the formation of N_2O approaching that over the spent catalyst was measured when 1% V_2O_5 was added to the fresh sample. XRF and ICP measurements gave the presence of MoO_3 with significant amounts in the used catalyst. Consequently, it is clear that such alien metals, mainly vanadium and molybdenum oxides, play a key role in creating a huge quantity of N_2O production.