Rotation-Assisted Synthesis of Thermally Stable Titanate Nanotubes and Their Application to Selective Catalytic Reduction of NO with NH_3

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Titanate nanotubes are widely used in various fields, but their weak thermal stability limits their application for catalyst supports. Here, we have discovered that titanate nanotubes with thick multi-walled structures can be fabricated by rotation-assisted synthesis. Porous structure of conventional nanotubes fabricated without rotation were easily collapsed after thermal treatment, whereas the nanotubes having a thick multiwalled structure retained their pore structure and the specific surface area (~300 m^2/g) even after calcination at 400°C in air. Vanadium-tungsten-oxide catalysts supported on the multi-walled titanate nanotubes were applied to NH_3-selective catalytic reduction, which showed stable NO_x reduction performance with high selectivity to N_2 even after hydrothermal aging. The activity and stability of the newly prepared catalysts were found to be correlated with sintering of VO_x on titanate nanotubes. This study demonstrats that the initial morphology of titanate nanotubes can have a significant effect on the activity of catalysts in long-term SCR operation.