Reactivity of V_2O_5/TiO_2 catalysts in NH_3 selective catalytic reduction as a function of the oxidation state of vanadium precursor

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Marine SCR catalyst requires higher DeNOx activity in the low temperature range comparing to automobile. In this study, we aimed at finding the optimum condition to prepare V_2O_5/TiO_2 catalyst known as low temperature SCR catalysts by changing oxidation states in vanadium precursor solution. V_2O_5 catalysts supported by TiO_2 (1, 3, 5 and 7 wt.%) were prepared by applying wet impregnation method using three precursor solutions with different oxidation states (V^{3+}, V^{4+} and V^{5+}). We utilized BET, ICP, XRD, Raman spectroscopy, XPS, UV-vis DRS and H_2-TPR to investigate the physicochemical properties catalysts. Also, NH_3-SCR reaction test was performed for these catalysts. It was found that V_2O_5/TiO_2 catalysts prepared from the precursor solution of V^{3+} oxidation state (VT(3+)) was the most active and selective to N_2 production simultaneously, produced the least amount of N_2O. The formation of highly coordinated polymeric vanadyl species on the sample attributes the highest NOx conversion and N_2 selectivity of the VT(3+) catalyst.