Deactivation of Pt/SiO_2 catalysts in the reduction of N_2O by H_2

김대환, 김문현*
대구대학교 환경공학과
(moonkim@daegu.ac.kr*)

The present study has been focused on the extent of on-stream deactivation of Pt nanoparticles, dispersed on high surface area silica, in the reduction of N_2O by H_2 at low temperatures, such as 90°C - 135°C. A sample of a 0.65% Pt/SiO_2 catalyst reduced at 400°C had very high deN_2O activity even at 110°C and 102,500h^{-1}, depending significantly on H_2-to-N_2O ratio, and whether or not the presence of guest molecules such as O_2 and H_2O. The catalyst showed the deactivation during the course of reduction even under a clean condition; however, such a deactivation profile was very reproducible when allowing repeated measurements to the deN_2O reaction. In case that a catalyst sample with greater Pt loadings, representatively 1.72% Pt/SiO_2, was used for this reaction, N_2O conversions near 100% were obtained for ~80 h after which the activity greadually decreased with time and was finally approached to 86%, but this catalyst also possessed a quite reproducible behavior in the deactivation. It is clear that the catalyst deactivation was associated with no changes in the nanoparticles sizes, as confirmed by H_2 chemisorption and XRD measurements. In order to clarify the deactivation mechanism, spectroscopic studies were conducted.