

Supplementary material

Effects of Nd-modification on the activity and SO₂ resistance of MnO_x/TiO₂ catalyst for low-temperature NH₃-SCR

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Table S1 The comparative low temperature SCR performance and SO₂ resistance of rare earth metal-modified MnO_x/TiO₂ catalysts.

Metals for modification	Preparation method	Reaction conditions	NO _x conversion	The decreased activity	Ref.
Nd	Coprecipitation	GHSV = 50000 h ⁻¹ ; 500 ppm NO; 500 ppm NH ₃ ; 5% O ₂ ; 10% H ₂ O; N ₂ balance	99 %@210 °C	From 99 % to 20 % in 6 h (50 ppm SO ₂ & 210 °C)	This work
Ce	Sol-Gel	GHSV = 40000 h ⁻¹ ; 1000 ppm NO; 1000 ppm NH ₃ ; 3 % O ₂ ; 3 % H ₂ O; N ₂ balance	100 %@250 °C	From 100 % to 84 % in 6.5 h (50 ppm SO ₂ & 210 °C)	8, 9, 10
Eu	Sol-Gel	GHSV = 108000 h ⁻¹ ; 600 ppm NO; 600 ppm NH ₃ ; 5 % O ₂ ; 5 % H ₂ O; Ar balance	98 %@250 °C	From 85 % to 70.1 % in 25 h (100 ppm SO ₂ & 150 °C)	23, 24
Y	Sol-Gel	GHSV = 14000 h ⁻¹ ; 600 ppm NO; 600 ppm NH ₃ ; 3 % O ₂ ; N ₂ balance	95 %@180 °C	N.A.	25
Ho (Fe)	Impregnation	GHSV = 20000 h ⁻¹ ; 0.08 % NO; 0.08 % NH ₃ ; 5 % O ₂ ; N ₂ balance	100 %@160 °C	From 90 % to 0 in 5 h (0.06 % SO ₂ & 15 % H ₂ O)	21, 22
Sm	Inverse coprecipitation	GHSV = 30000 h ⁻¹ ; 500 ppm NO; 500 ppm NH ₃ ; 5 % O ₂ ; N ₂ balance	91 %@175 °C	From 90 % to 73 % in 19 h (100 ppm SO ₂ & 2.5 % H ₂ O & 200 °C)	56

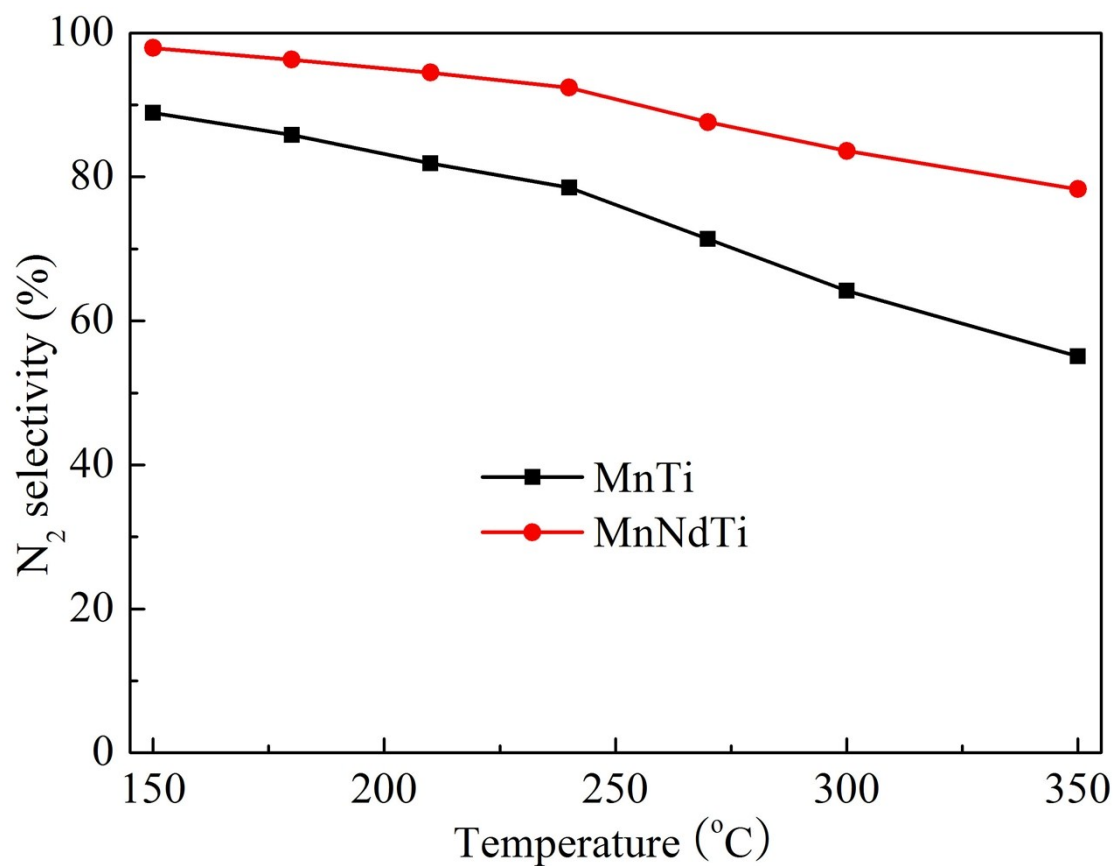


Fig. S1 The N₂ selectivity of MnTi and MnNdTi catalysts.

The N₂ selectivity at each temperature point is calculated according to formulas (1), as follows:

$$N_{2\text{selec.}}(\%) = \left(1 - \frac{2[N_2O]_{\text{out}}}{[NO_x]_{\text{in}} + [NH_3]_{\text{in}} - [NO_x]_{\text{out}} - [NH_3]_{\text{out}}} \right) \times 100\% \quad (1)$$

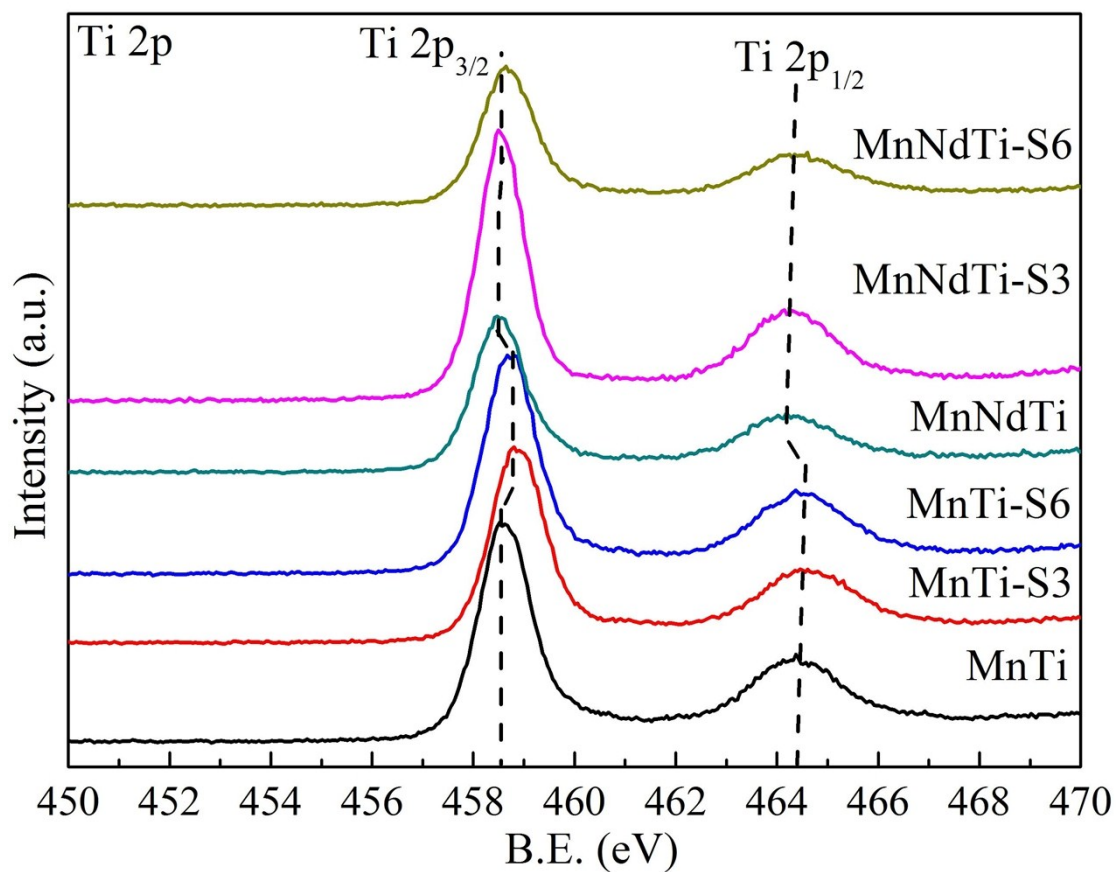


Fig. S2 Ti 2p (XPS) spectra of fresh and used catalysts.

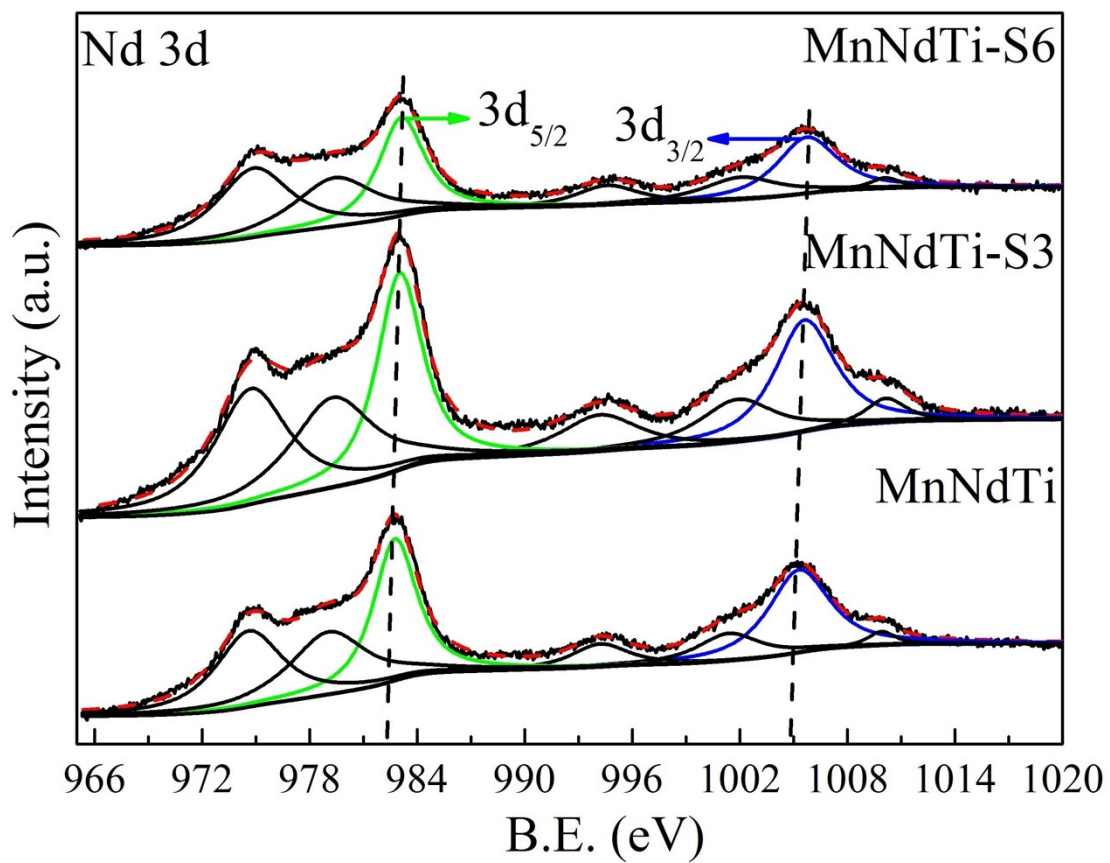


Fig. S3 Nd 3d (XPS) spectra of fresh and used catalysts.

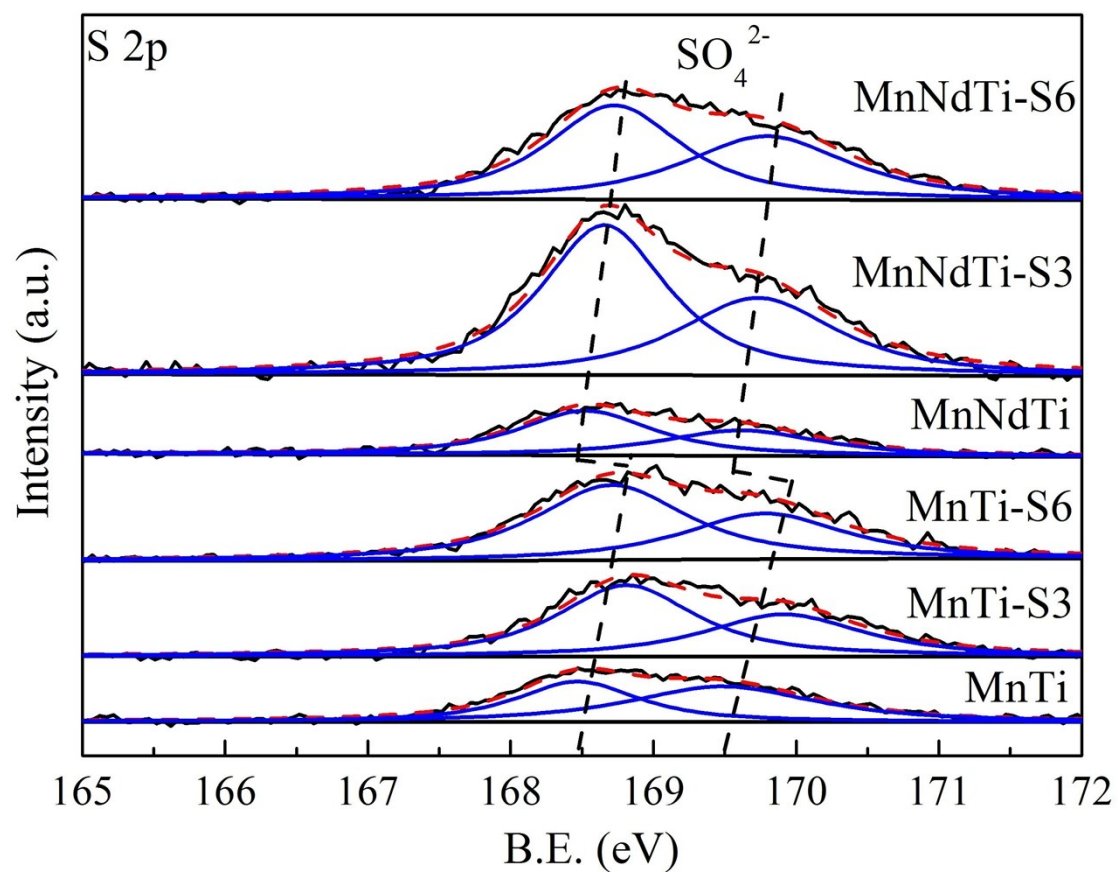


Fig. S4 S 2p (XPS) spectra of fresh and used catalysts.