Electronic Supplementary Material (ESI) for Catalysis Science & Technology.

Supplementary Information

Superior Low-temperature NO Catalytic Performance of $PrMn_2O_5$ Over $SmMn_2O_5$ Mullite-type Catalysts

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NO conversion efficiencies of $PrMn_2O_5$ and $SmMn_2O_5$ samples synthesized under similar hydrothermal conditions of 180 °C for 24 h and processed with different concentrations of HNO_3 (0-8%) are measured to optimize the processing condition to facilitate maximum conversion of NO. The NO conversion efficiency as a function of reaction temperature for samples treated with 0% (black triangles), 2% (red circles), and 8% (blue squares) HNO_3 are shown in Fig. S1. The activity of $PrMn_2O_5$ (Fig. S1a) improved only slightly from no acid wash (Fig. S1a, black triangles) to 2% HNO_3 wash (Fig. S1a, red circles), while washing with 8% HNO_3 (Fig. S1a, blue squares) shows the best performance. On the other hand, the best conversion efficiency for $SmMn_2O_5$ (Fig. S1b,) is obtained with washing with 2% HNO_3 (Fig. S1b, red circles) while further increase in acid concentration to 8% (Fig. S1b, blue squares) decreased the catalytic activity. Therefore, we determine 8% and 2% acid wash to be the optimal processing condition for $PrMn_2O_5$ and $SmMn_2O_5$, respectively. Hence, these two processing conditions were used for this study.

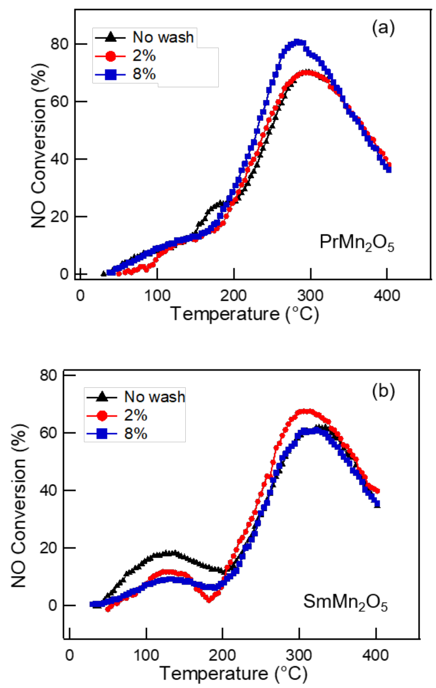

Fig. S1. NO conversion efficiency as a function of temperature for (a) $PrMn_2O_5$; (b) $SmMn_2O_5$ with no acid wash (black triangles), 2% HNO_3 wash (red circles), and 8% HNO_3 wash (blue squares), respectively. The reaction gas composition consisted of 400 ppm NO, 10% O_2, and N_2 balance at a space velocity of 100000 h^{-1}.

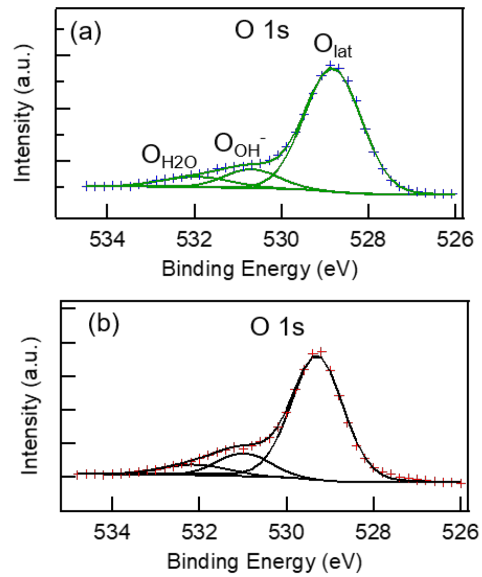

Fig. S2. XPS spectra of O 1s core-levels in (a) $PrMn_2O_5$ (blue); (b) $SmMn_2O_5$ (red) samples, respectively. The green and black lines represent the peak fitting on $PrMn_2O_5$ and $SmMn_2O_5$, respectively.

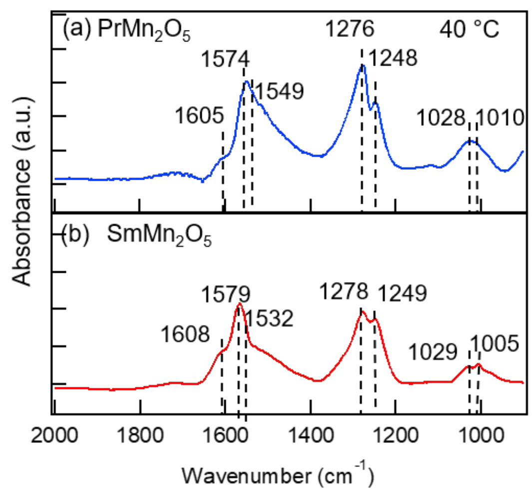

Fig. S3. FTIR spectra after coadoption of 1% NO and 10% O_2 balanced with He at 40 °C on (a) $PrMn_2O_5$ (blue) and (b) $SmMn_2O_5$ (red), respectively.

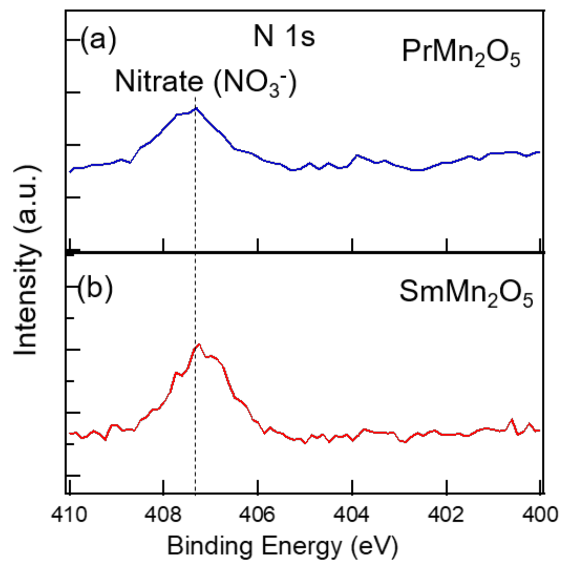

Fig. S4. N 1s XPS spectra shows nitrate at 407.3 eV as the dominant intermediate species formed after exposure to NO at 40 °C on (a) $PrMn_2O_5$ (blue) and (b) $SmMn_2O_5$ (red), respectively.