Supporting Information

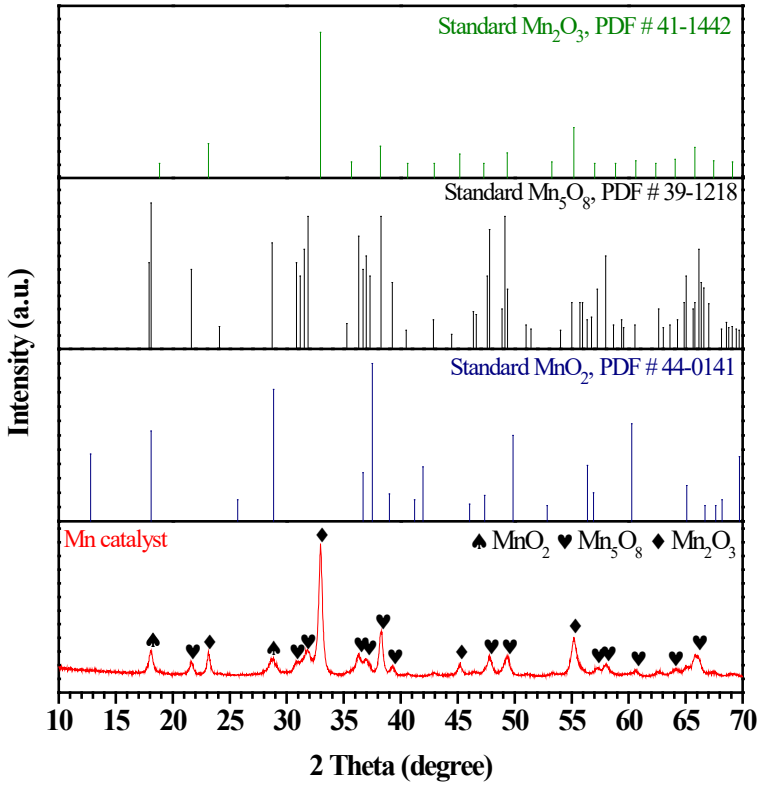

Figure S1. XRD patterns of the Mn samples and the standard patterns of MnO_2, Mn_5O_8, and Mn_2O_3 phases.

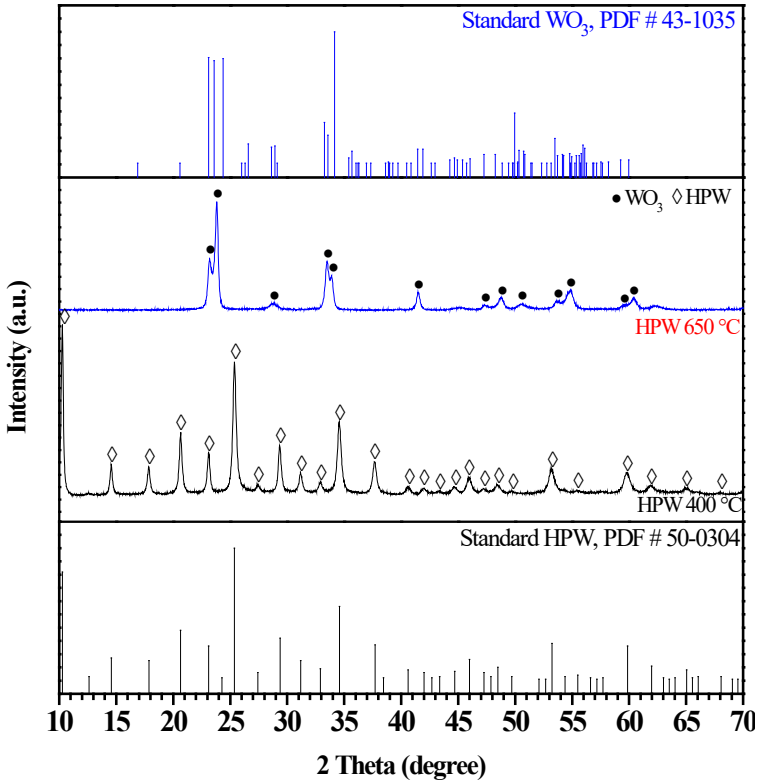

Figure S2. XRD patterns of HPW calcinated at 400 °C and 650 °C; the standard patterns of HPW and WO_3 phases.

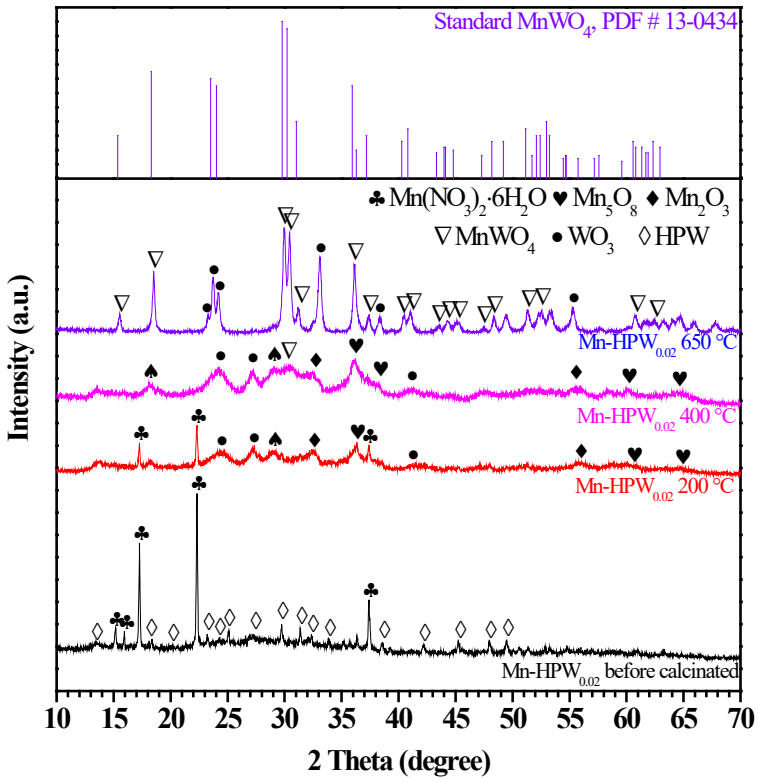

Figure S3. XRD patterns of Mn-HPW$_{0.02}$ before calcination, Mn-HPW$_{0.02}$ calcinated at 200 °C, 400 °C, and 650 °C; the standard patterns of $MnWO_4$ phases.

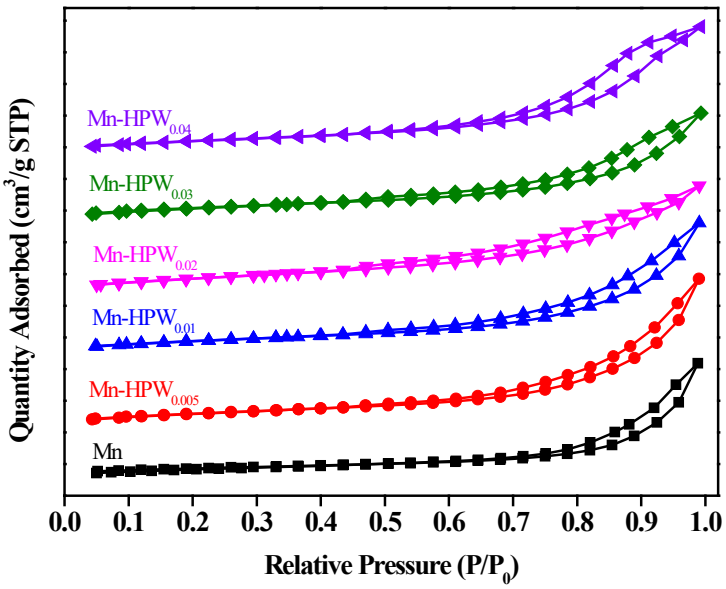

Figure S4. N_2 adsorption-desorption isotherms on the Mn and Mn-HPW_x catalysts.

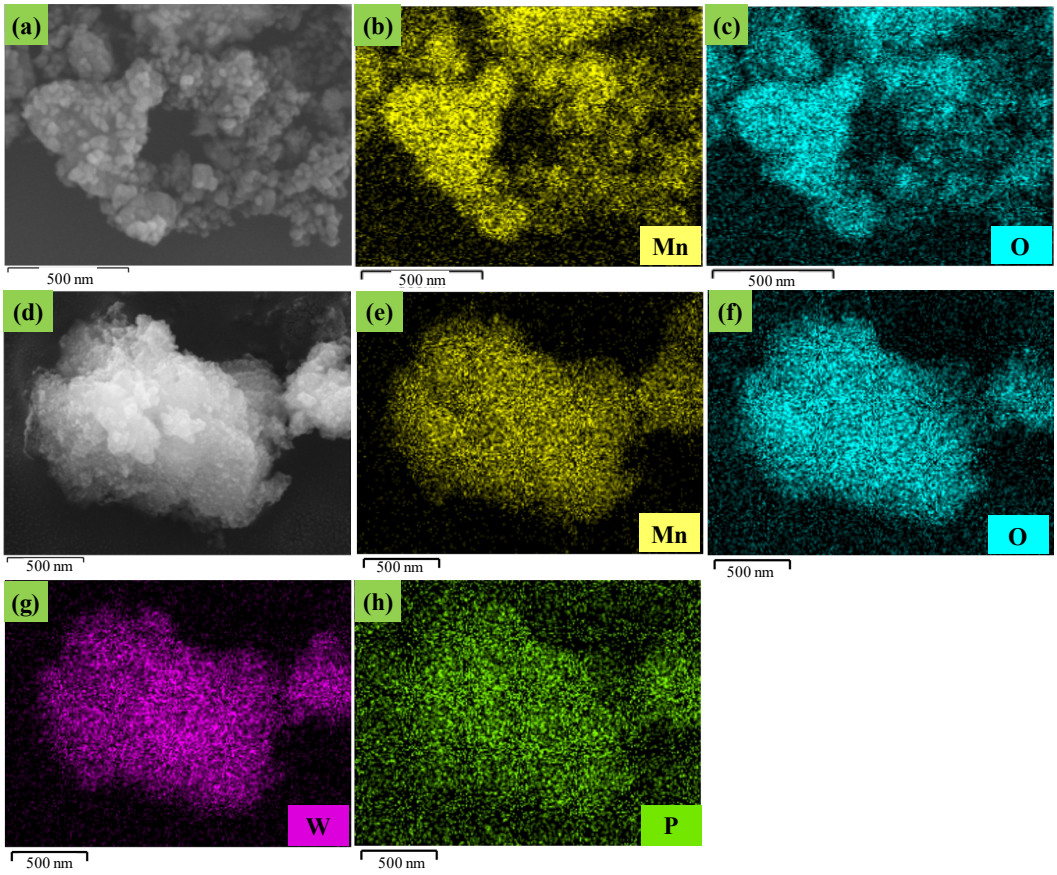

Figure S5. EDX mapping of Mn (a-c) and Mn-$HPW_{0.02}$ (d-h).

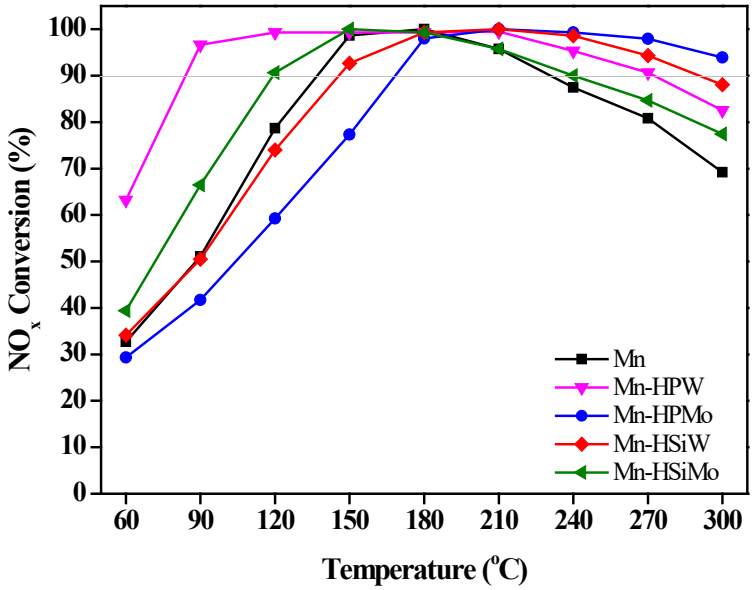

Figure S6. NH_3-SCR activity on Mn, Mn-HPW, Mn-HPMo, Mn-HSiW, and Mn-HSiMo at 60-300 °C.

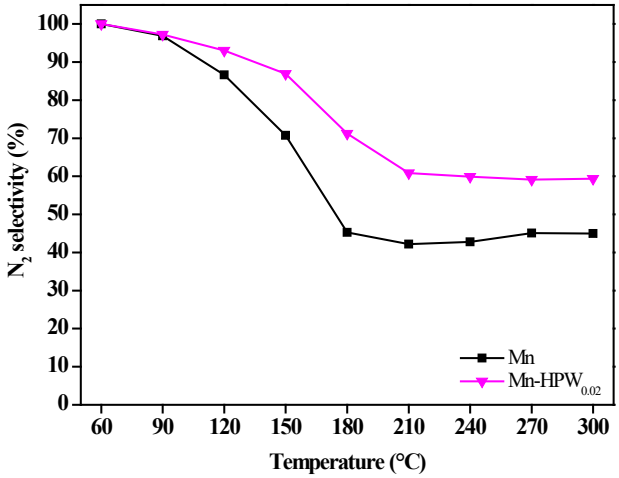

Figure S7. N_2 selectivity on the Mn and Mn-$HPW_{0.02}$ catalysts at 60-300 °C.

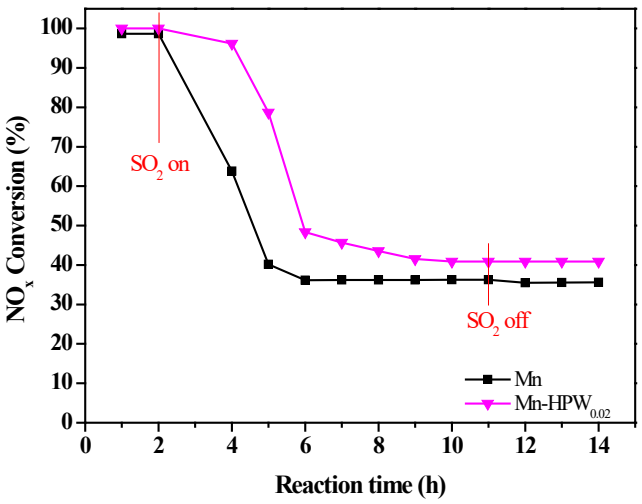

Figure S8. Effect of 50 ppm SO_2 on NH_3-SCR activity over the Mn and Mn-$HPW_{0.02}$ catalysts at 150 °C.

Table S1. Representative Mn-based catalysts decorated by different assistant for NH_3-SCR.

Catalyst	NO_x conversion	Reaction condition							Reference
		[NO] (ppm)	[NH_3] (ppm)	[O_2] (%)	Flow rate (mL/min)	GHSV (h^{-1})	WHSV (mL/g·h)	Weight (g)	
Mn-Nb	> 90% (125-200 °C)	500	500	5	500	50,000	——	——	[58]
Mn-Co	> 90% (125-350 °C)	500	500	3	210	38,000	——	0.40	[30]
Mn-Sm	> 90% (75-200 °C)	500	500	5	——	48,600	——	0.30	[53]
Mn-Fe	~100% (120-240 °C)	500	500	5	600	36,000	——	0.47	[28]
Mn-Eu	> 90% (100-400 °C)	600	600	5	1000	108,000	——	0.28	[59]
Mn-Cu	> 90% (125-225 °C)	500	500	3	200	100,000	——	0.15	[60]
Mn-Ni	~100% (150-300 °C)	600	600	5	375	45000	——	——	[61]
Mn-Ce	> 90% (120-180°C)	500	500	2	100	11,000	30,000	0.20	[62]
Mn-Ce	> 90% (100-400 °C)	500	500	5	200	32,000	——	——	[63]
Mn-$HPW_{0.02}$	> 90% (90-270 °C)	500	500	5	200	——	80,000	0.15	In this work

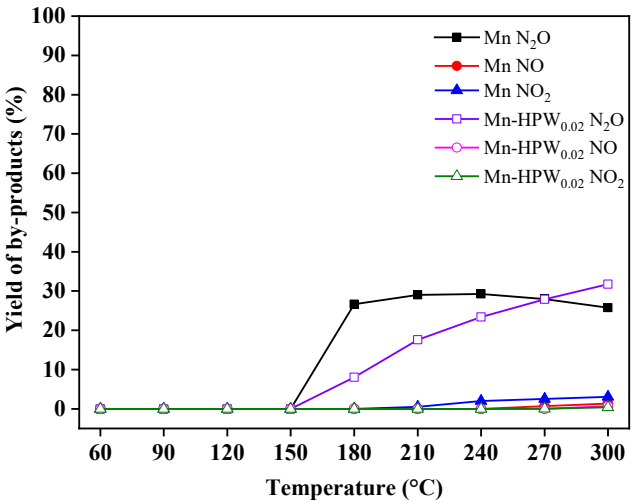

Figure S9. Yield of N_2O, NO, and NO_2 on Mn and Mn-$HPW_{0.02}$ at 60-300 °C.

Table S2 Reduction temperature and relative ratio in H_2-TPR curves.

Catalyst	Reduction temperature (°C)		Relative ratio	
	Peak I	Peak II	Peak I	Peak II
Mn	315	470	1.00 *	1.00 *
Mn-HPW$_{0.005}$	315	470	0.62	0.91
Mn-HPW$_{0.01}$	315	480	0.55	0.66
Mn-HPW$_{0.02}$	315	490	0.51	0.60
Mn-HPW$_{0.03}$	315	470	0.34	0.31
Mn-HPW$_{0.04}$	308	470	0.18	0.27

***** The area of peak I and peak II over the Mn catalyst is set as 1.00, respectively, compare with other catalysts.

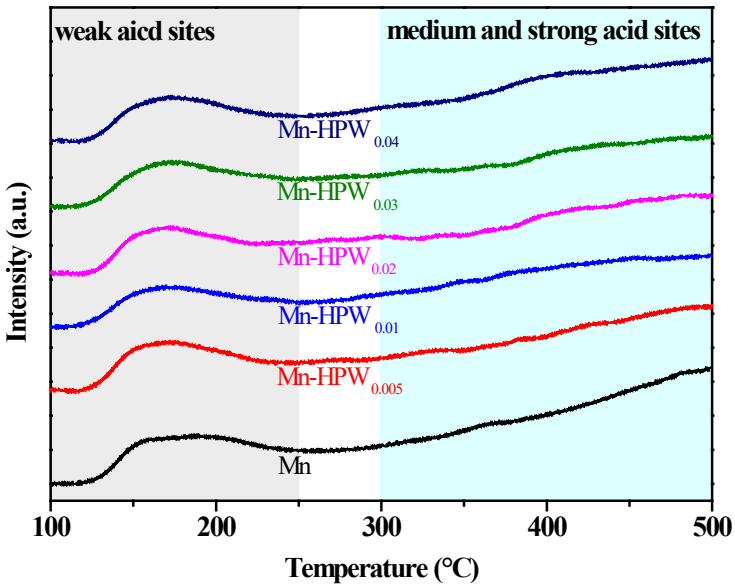

Figure S10. NH_3-TPD profiles of the Mn and Mn-HPW_x catalysts.

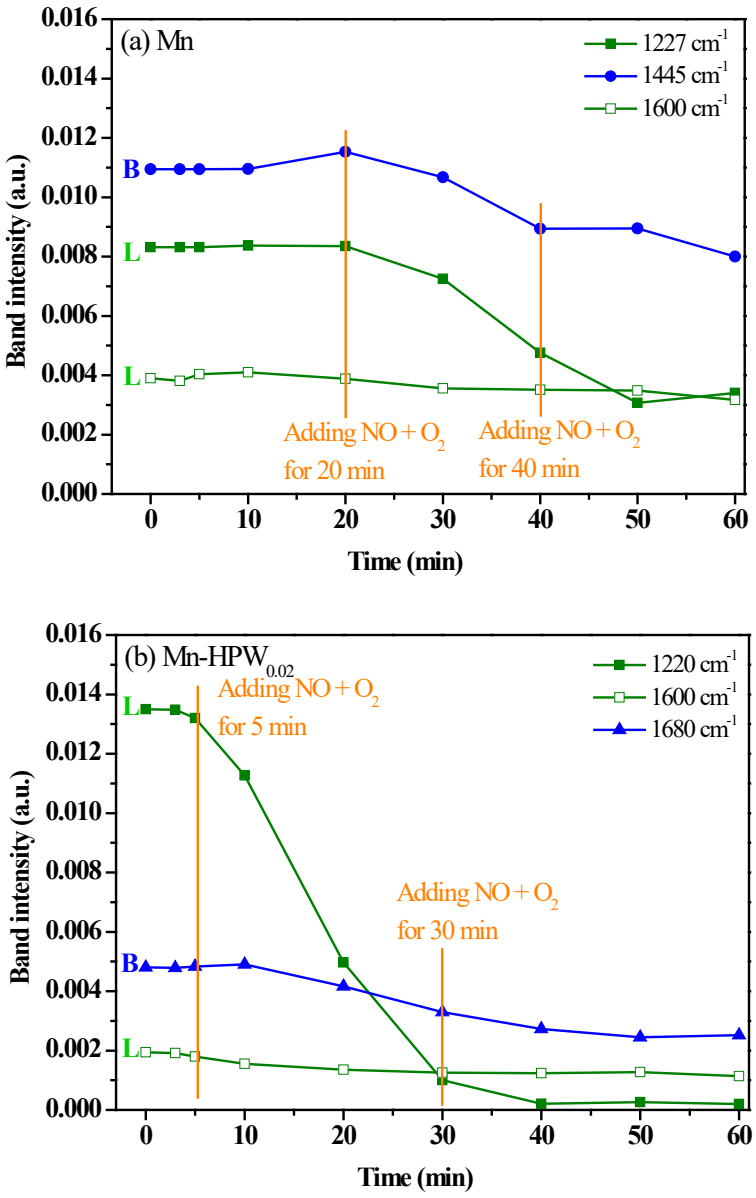

Figure S11. Dependence of the band intensities of NH_3-derived species on time over Mn (a) and Mn-$HPW_{0.02}$ (b).

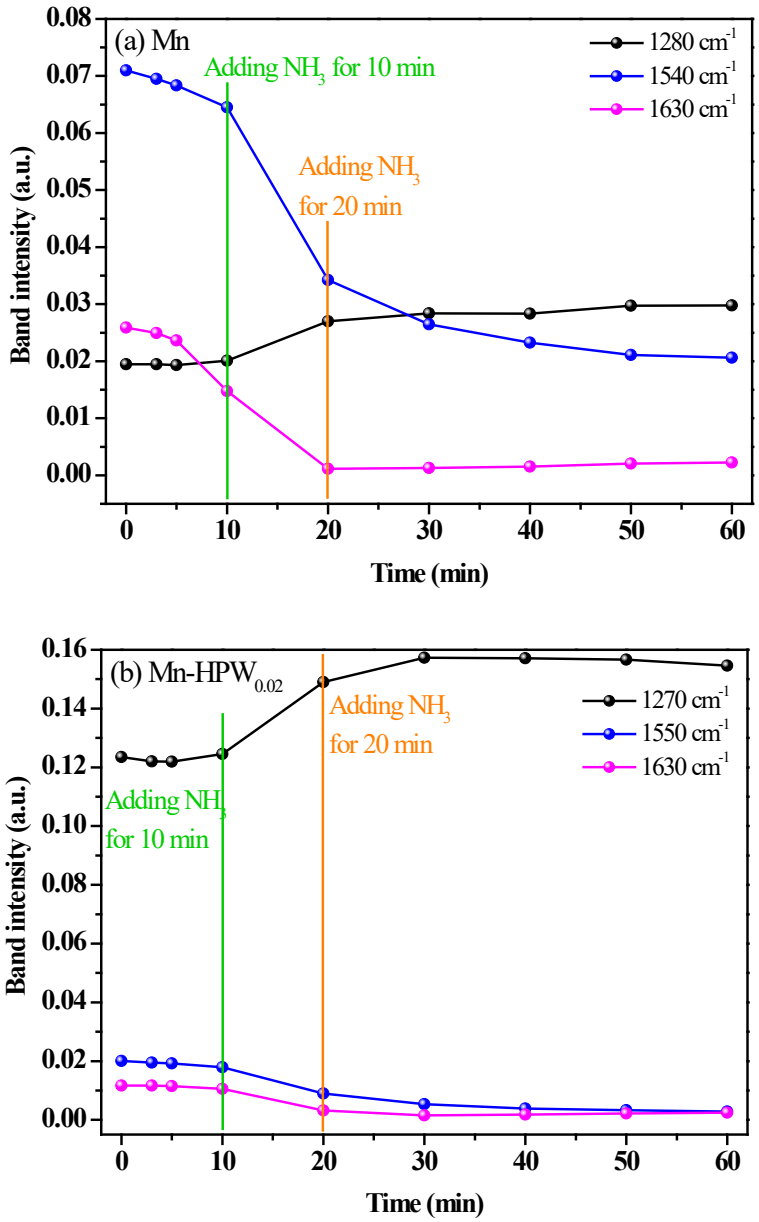

Figure S12. Dependence of the band intensities of the NO_x-derived species on time over Mn (a) and Mn-$HPW_{0.02}$ (b).