Supporting Information

$FeVO_4$-supported Mn-Ce oxides for the low-temperature selective catalytic reduction of NO_x by NH_3

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1. Figures

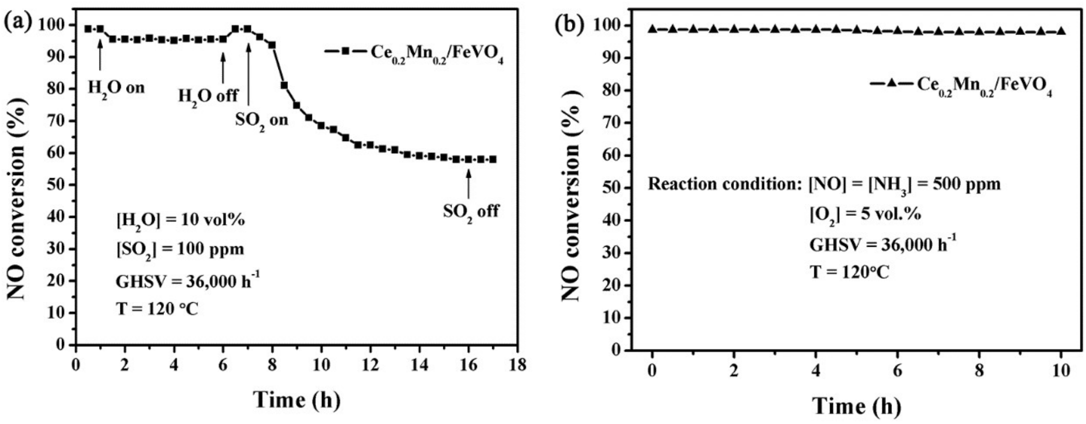

Fig. S1. The water resistance and sulfur resistance test (a), stability test (b) of the $Ce_{0.2}Mn_{0.2}/FeVO_4$ catalyst under the condition of 36000 h^{-1} and 120 °C.

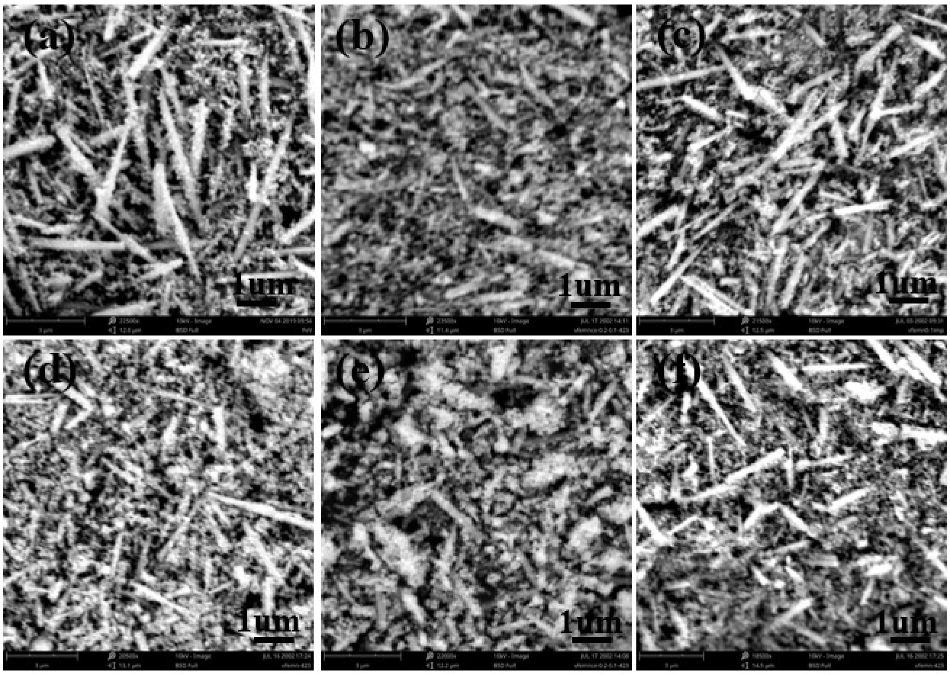

Fig. S2. The SEM tests of $FeVO_4$ (a), $Mn_{0.2}/FeVO_4$ (b), $Ce_{0.1}Mn_{0.2}/FeVO_4$ (c), $Ce_{0.2}Mn_{0.2}/FeVO_4$ (d), $Ce_{0.3}Mn_{0.2}/FeVO_4$ (e), $Ce_{0.2}/FeVO_4$ (f) catalysts.

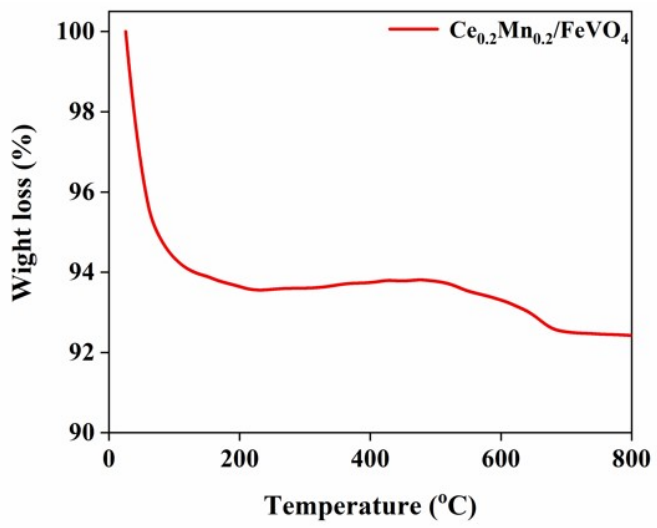

Fig. S3. TG profile of the $Ce_{0.2}Mn_{0.2}/FeVO_4$

2. Tables

Table S1

Summary of de-NO_x performance over the similar catalysts to Mn-Ce/$FeVO_4$ reported in literatures.

Catalyst	Preparation method	Calcination	Reaction conditions	NO_x conversion	Refs.
Ce-Mn/$FeVO_4$	A two-step approach	420°C /3h	NO = 500 ppm, NH_3 = 500 ppm, O_2 = 5%, GHSV = 36,000 h^{-1}	above 90%（90–420℃）	This work
Mn-Ce mixed oxide	Surfactant-template (ST) method	500°C /4h	NO = 500 ppm, NH_3 = 500 ppm, O_2 = 5%, GHSV = 64,000 h^{-1}	Nearly 100%（100-200℃）	[24]
$MnCoCeO_x$ microflowers	Co-precipitation	350°C /2h	NO = 500 ppm, NH_3 = 500 ppm, O_2 = 5%, GHSV = 24,000 h^{-1}	100%（100-270℃）	[25]
Mn/CeO_2（microspheres）	A two-step approach	500°C /4h	NO = 500 ppm, NH_3 = 500 ppm, O_2 = 5%, GHSV = 36,000 h^{-1}	almost 100%（150-240℃）	[26]
$Mn_3CeW_aO_x$	Homogeneous precipitation method.	500°C /5h	NO = 500 ppm, NH_3 = 500 ppm, O_2 = 5%, GHSV = 100,000 h^{-1}	above 70%（100–275℃）	[27]
$Fe_{1-x}V_xO_\delta$	Homogeneous precipitation method	400°C /5h	NO = 500 ppm, NH_3 = 500 ppm, O_2 = 5%, GHSV = 50,000 h^{-1}	above 90%（175–400℃）	[42]
FeV_xO_y 1-D nanostructures	A modified hydrothermal method	450°C /2h	NO = 500 ppm, NH_3 = 500 ppm, O_2 = 3%, GHSV = 20,000 h^{-1}	above 80%（200–400℃）	[43]
$FeVO_4/TiO_2$	Co-impregnation	400°C /6h	NO = 500 ppm, NH_3 = 500 ppm, O_2 = 5%, GHSV = 50,000 h^{-1}	Nearly 100%（250–400℃）	[44]
$Fe_xAl_{1-x}VO_4/TiO_2-WO_3-SiO_2$	Wet impregnation	650°C /10h	NO = 500 ppm, NH_3 = 500 ppm, O_2 = 5%, GHSV = 50,000 h^{-1}	above 90%（350–500℃）	[45]
$FeVO_4$/ $TiO_2-WO_3-SiO_2$	Co-precipitation	550°C /3h	NO = 1000 ppm, NH_3 = 1000 ppm, O_2 = 5%, H_2O = 10%, GHSV = 30,000 h^{-1}	above 90%（246–476℃）	[46]

Table S2. BET and BJH results based on N_2 adsorption/desorption isotherms of the catalysts

Sample	**S_{BET} (m^2g^{-1})**	**Pore Volume (cm^3g^{-1})**	**Average Pore Diameter (nm)**
$Mn_{0.2}/FeVO_4$	48.93	0.13	10.51
$Ce_{0.1}Mn_{0.2}/FeVO_4$	73.17	0.18	9.58
$Ce_{0.2}Mn_{0.2}/FeVO_4$	60.72	0.12	5.97
$Ce_{0.3}Mn_{0.2}/FeVO_4$	73.08	0.10	5.28
$Ce_{0.2}/FeVO_4$	51.15	0.11	13.22
$FeVO_4$	28.22	0.13	29.98

Table S3. The relative radio of Mn^{4+}, Ce^{3+} and O_S on the catalysts.

Sample	**Mn^{4+}/Mn^{n+} (%)**	**$Ce^{3+}/(Ce^{3+}+Ce^{4+})$ (%)**	**$O_S/(O_S+O_L)$ (%)**
$Mn_{0.2}/FeVO_4$	8.49	…	20.01
$Ce_{0.1}Mn_{0.2}/FeVO_4$	11.04	40.56	24.17
$Ce_{0.2}Mn_{0.2}/FeVO_4$	21.61	43.60	26.08
$Ce_{0.3}Mn_{0.2}/FeVO_4$	14.96	44.18	29.91

Table S4. The area of the H_2-TPR and NH_3-TPD peaks of the catalysts.

Sample	**Area of H_2-TPR spectra**	**Area of desorbed NH_3**
$Mn_{0.2}/FeVO_4$	1236	156
$Ce_{0.1}Mn_{0.2}/FeVO_4$	1385	264
$Ce_{0.2}Mn_{0.2}/FeVO_4$	2034	323
$Ce_{0.3}Mn_{0.2}/FeVO_4$	1692	216
$Ce_{0.2}/FeVO_4$	1300	173
$FeVO_4$	1192	139