Electronic Supplementary Information

Tunable preparation of highly dispersed Ni$_x$Mn-LDO catalysts derived from Ni$_x$Mn-LDHs precursors and application in low-temperature NH$_3$-SCR reaction

Benhui Hou, [a] Yali Du, [b] Xuezhen Liu, [a] Chao Ci, [a] Xu Wu*[a] and Xianmei Xie *[a]

[a] College of Chemistry and Chemical Engineering, Taiyuan University of Technology, Taiyuan 030024, PR China.

[b] College of Chemistry and Chemical Engineening, Jinzhong University, Jinzhong 030619, PR China.

* Corresponding authors. E-mail address: wuxu@tyut.edu.cn, xxmsxty@sina.com. Fax: +86-351-6018528, 86-351-6018564.

Figure captions

Table S1 Comparison of catalytic performance of different Ni-Mn oxides catalysts

Catalysts	Preparation method	Reaction conditions	NO$_x$ conversion/% (Tem./°C)	Ref.
Ni-MnOx	co-precipitation	500 ppm NO,500 ppm NH$_3$, 5 vol %O$_2$ in He, GHVS=64.000 h^{-1}	80% (100-300 °C)	[1]
NiMn$_2$O$_4$	solvothermal	500 ppm NO, 500 ppm NH$_3$, 5 vol % O$_2$ in Ar, GHVS=68.000 h^{-1}	80% (85-250°C)	[2]
Ni-Mn-O-10	low temperature crystal splitting	400 ppm NO, 400 ppm NH$_3$, 2 vol % O$_2$ in N$_2$, GHVS=30.000 h^{-1}	80% (90-270°C)	[3]
Ni-Mn(3DH-NM/NF)	hydrothermal	500 ppm NO, 500 ppm NH$_3$, 3vol % O$_2$ in N$_2$, GHVS=20.000 h^{-1}	80% (250-360°C)	[4]
NiMn-LDO	co-precipitation	500 ppm NO, 500 ppm NH$_3$, 5 vol % O$_2$ in He, GHSV=45.000 h^{-1}	80% (160-390°C)	This work

Ni:Mn = 3.78

Elt.	Line	Intensity (c/s)	Conc	Units	Error 2-sig	MDL 3-sig	
O	Ka	3,385.70	39.151	wt.%	0.667	0.831	
Mn	Ka	657.02	12.071	wt.%	0.485	0.582	
Ni	Ka	1,268.57	48.778	wt.%	1.580	1.935	
			100.000	wt.%			Total
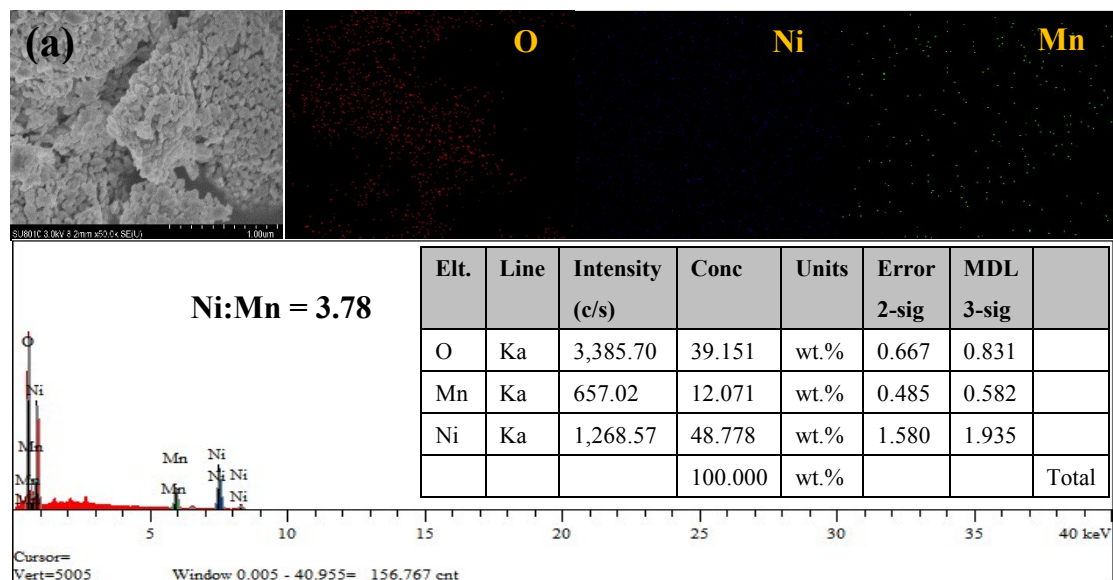
Fig. S1 SEM image and EDS mapping of Ni$_3$Mn-LDO catalyst.

(b) O Ni Mn

Ni:Mn = 4.40

Elt.	Line	Intensity (c/s)	Conc	Units	Error 2-sig	MDL 3-sig	
O	Ka	2,798.23	25.877	wt.%	0.549	0.684	
Mn	Ka	868.80	13.010	wt.%	0.474	0.568	
Ni	Ka	1,686.43	61.113	wt.%	1.562	1.914	
			100.000	wt.%			Total

Cursor=
Vert=4128   Window 0.005 - 40.955= 165,184 cnt
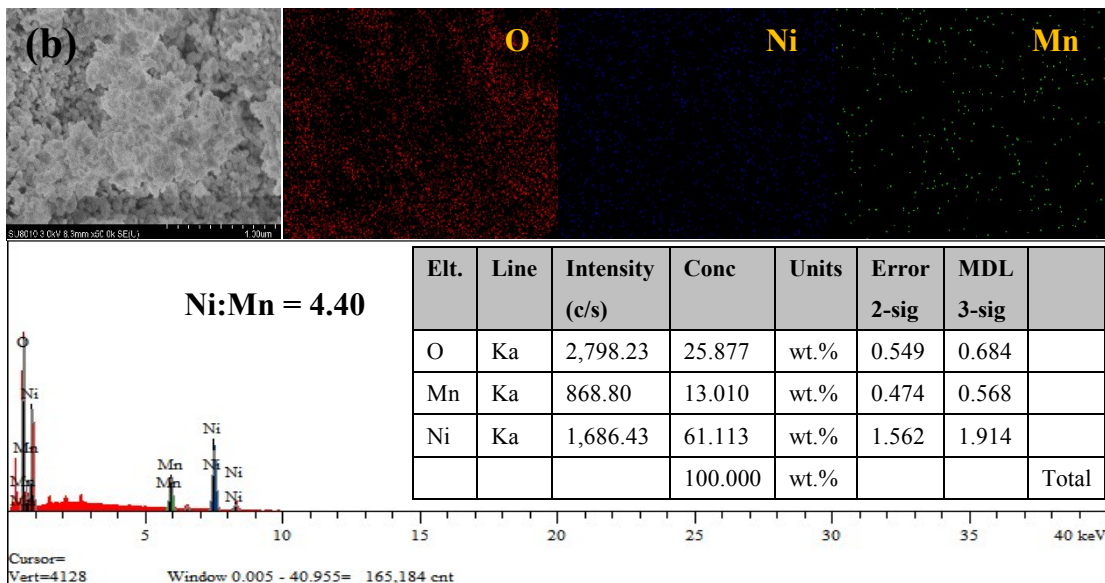
Fig. S2 SEM image and EDS mapping of Ni_4Mn-LDO catalyst.

(c) O Ni Mn

Ni:Mn = 4.68

Elt.	Line	Intensity (c/s)	Conc	Units	Error 2-sig	MDL 3-sig	
O	Ka	685.18	25.436	wt.%	0.929	1.160	
Mn	Ka	202.97	12.422	wt.%	0.763	0.911	
Ni	Ka	443.80	62.141	wt.%	2.718	3.333	
			100.000	wt.%			Total

Cursor=
Vert=1835   Window 0.005 - 40.955= 80,879 cnt
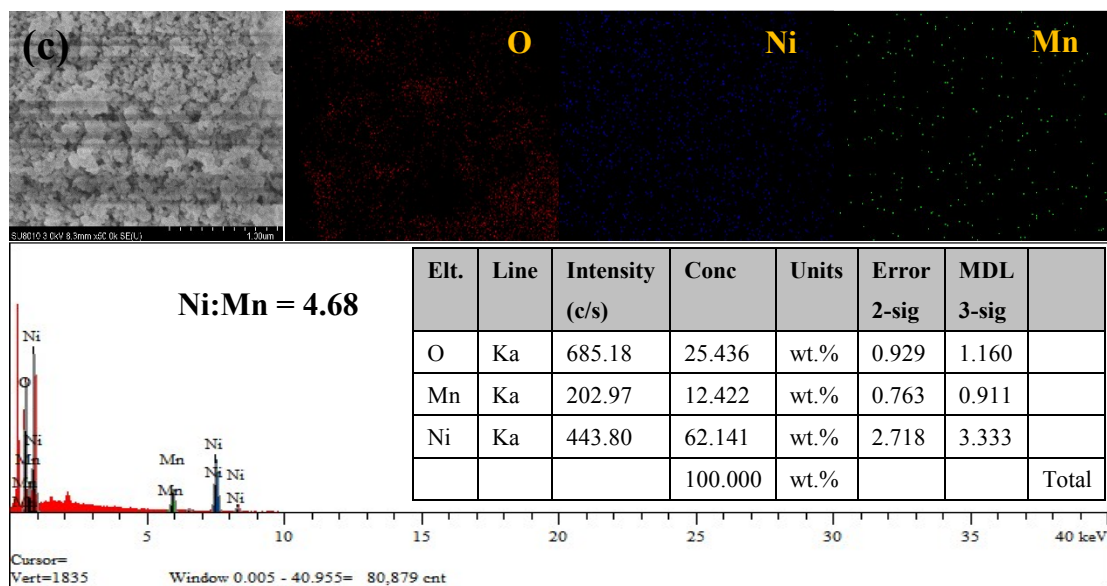
Fig. S3 SEM image and EDS mapping of Ni_5Mn-LDO catalyst.

Elt.	Line	Intensity (c/s)	Conc	Units	Error 2-sig	MDL 3-sig	
O	Ka	1,167.61	19.679	wt.%	0.703	0.876	
Mn	Ka	345.94	10.981	wt.%	0.552	0.662	
Ni	Ka	959.86	69.340	wt.%	2.259	2.768	
			100.000	wt.%			Total
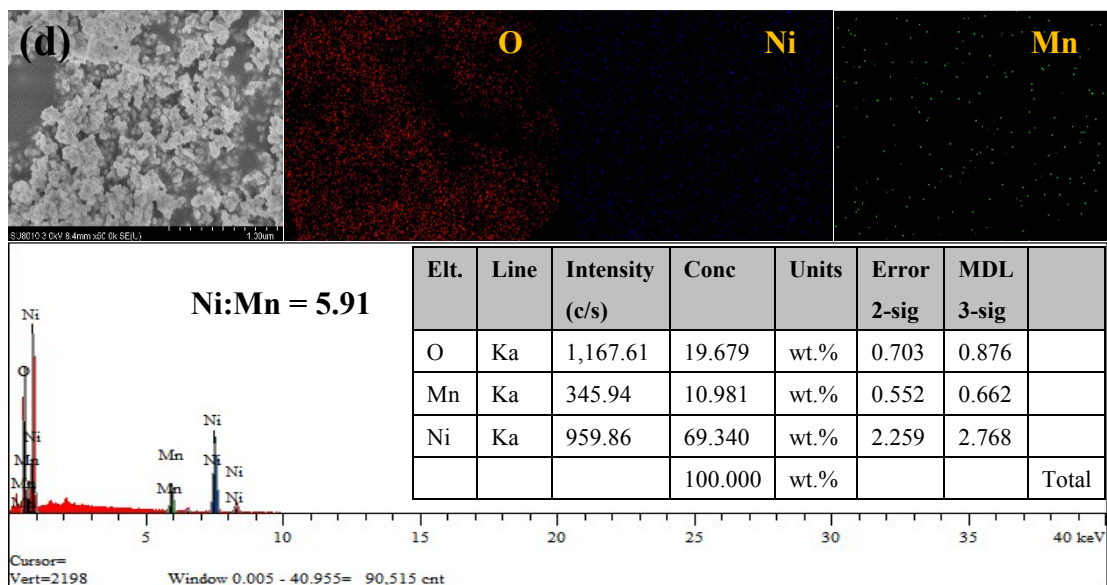
Fig. S4 SEM image and EDS mapping of Ni_6Mn-LDO catalyst.

Notes and references

[1] Y. Wan, W. R. Zhao, Y. Tang, L. Li, H. J. Wang, Y. L. Cui, J. L. Gu, Y.S. Li and J. L. Shi, Appl. Catal. B, 148, (2014) 114-122.

[2] Y. L. Han, J. C. Mu, X. Y. Li, J. S. Gao, S. Y. Fan, F. Tan, Q. D. Zhao, Chem. Commun. 54 (2018) 9797-9800.

[3] B. Meng, Z. B. Zhao, Y. S. Chen, X. Z. Wang, Y. Li and J. S. Qiu, Chem. Commun. 50 (2014) 12396-12399.

[4] S. X. Cai, D. S. Zhang, L. Y. Shi, J. Xu, L. Zhang, L. Huang, H. R. Li and J. P. Zhang, Nanoscale, 6 (2014) 7346.