Supporting Information

Mg-doped manganese-based layered double oxide catalyst realizes the highly selective oxidation of toluene derivatives to aldehydes

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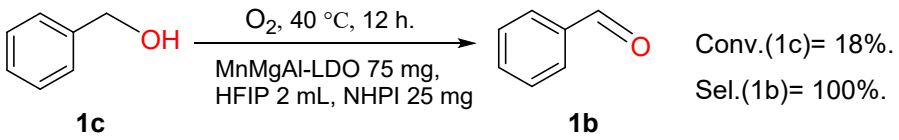
Benzyl alcohol oxidizes to benzaldehyde

Typically, a mixture of 1.0 mmol benzyl alcohol, 2 mL HFIP, 25mg NHPI and 75 mg MnMgAl-LDO were magnetically stirred at 40 ℃ under 1 atm of O_2 atmosphere. The reaction was analyzed through a GC-MS (SHIMADZU, GCMS-QP2010 SE).The conversion rate of benzyl alcohol was 12% after 12 h reaction.



1c **1b**

Scheme S1 Oxidation of benzyl alcohol to benzaldehyde under the standard reaction conditions.

Characterization of the catalyst

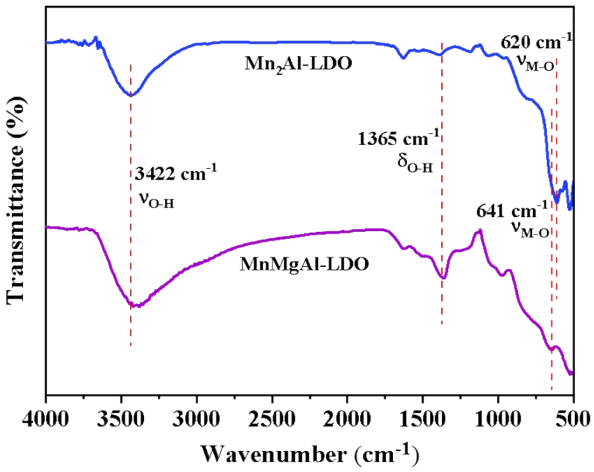


Fig. S1. FT-IR spectra of the MnMgAl-LDO and Mn_2Al-LDO.

Characterization of the recycled catalyst

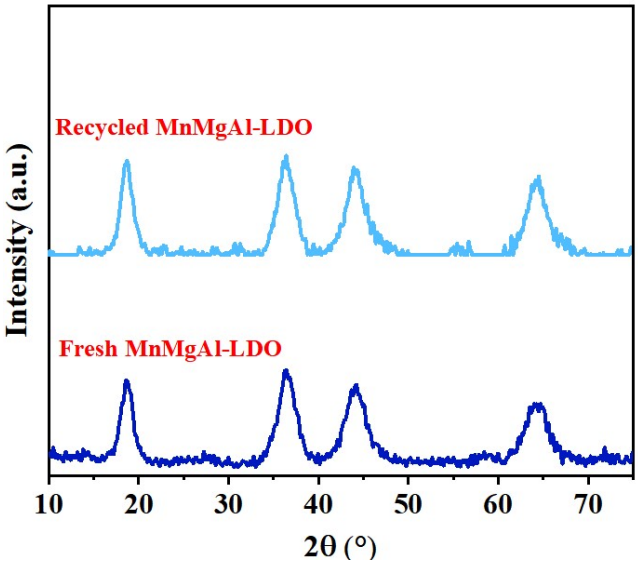


Fig. S2. XRD of the recycled MnMgAl-LDO.

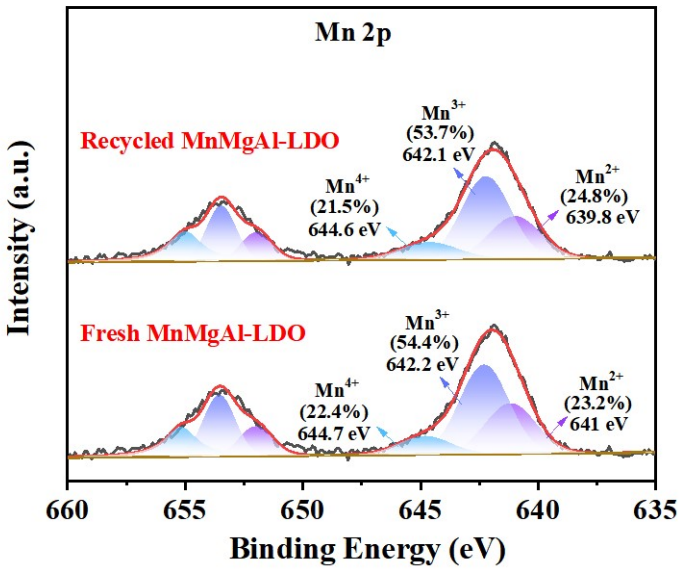


Fig. S3. XPS spectra of Mn 2p of recyled MnMgAl-LDO.

Table S1. ICP of the recycled MnMgAl-LDO.

Samples	Content (wt%)			Mn:Mg:Al
	Mn	Mg	Al	
MnMgAl-LDO(Fresh)	25.80	13.80	12.40	1.02:1.25:1
MnMgAl-LDO(Recycled)	25.04	13.12	11.82	1.04:1.25:1

Table S2. Some typical catalytic systems based on NHPI are used for aerobic oxidation of toluene.

Entry	Catalyst	Reaction conditions	Conv. /%	Sel. /%	Ref.
1	$Co(OAc)_2$	NHPI, CH_3CN, O_2	84.0	4.0	[1]
2	porphyrin-biscopper hexaphyrin	NHPI, CH_3CN, O_2	21.5	59.3	[2]
3	$CoOx/SiO_2$	NHPI, HFIP, O_2	91.0	68.2	[3]
5	CoMnAl-LDO	NHPI, HFIP, O_2	55.7	58	[4]
6	MnMgAl-LDO	NHPI, HFIP, O_2	77.0	86.0	This work
7	MnMgAl-LDO	NHPI, HFIP, Air	71.2	81.3	This work

References

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