Electronic Supplementary Material (ESI) for New Journal of Chemistry.
This journal is © The Royal Society of Chemistry and the Centre National de la Recherche Scientifique 2024

Supplemental Information

Non-precious cobalt-bismuth binary oxide as a superior catalyst for the highly selective aerobic oxidation of 5-hydroxymethylfurfural to 2,5-furandicarboxylic acid in aqueous solvent

Qian Zhang [a], Aicheng Chen * [a],Weixing Pan [a], and Hu Zhu * [a]

[a] Fujian Provincial University Engineering Research Center of Industrial Biocatalysis, Fujian Provincial Key Laboratory of Advanced Materials Oriented Chemical Engineering, College of Chemistry and Materials Science, Fujian Normal University, Fuzhou 350007, P.R.China

Corresponding authors: Aicheng Chen, chenaicheng@fjnu.edu.cn; Hu Zhu, zhuhu@fjnu.edu.cn

Table S1 Comparison on catalytic performances of cheap metal oxide catalysts for the aerobic oxidation of HMF to FDCA in water

Catalyst	Oxidant	Additive		Temp.	Time	Conv.	FDCA Yield	Ref.
		Dosage	Concentration	(°C)	(h)	(%)	(%)	
CoBi-12	0.6 MPa O_2	2 equiv. NaOH	0.013 M	110	3	100	98.23	This work
$Ce_{0.5}Bi_{0.5}O_{2-\delta}$	1 MPa O_2	4 equiv. NaOH	0.60 M	65	1	100	8	S1
amor-MnO_2	1 MPa	3 equiv. $NaHCO_3$	0.12 M	130	3	100	98	S2
CoCe-15	0.6 MPa O_2	4 equiv. NaOH	0.027 M	130	4	100	77.4	S3
Co-Mn-0.25	1 MPa O_2	2 equiv. $NaHCO_3$	0.10 M	120	5	99	95.2	S4
MnO_x-CeO_2	2.0 MPa O_2	2 equiv. $KHCO_3$	0.20 M	110	12	98.5	88.7	S5
$CuMn_2O_4$	1MPa O_2	2 equiv. $NaHCO_3$	0.10 M	120	18	100	90.1	S6
MOF-Mn_2O_3	1.4 MPa O_2	3 equiv. $NaHCO_3$	0.15 M	100	24	100	99.5	S7
β-MnO_2-HS	1 MPa O_2	3 equiv.$NaHCO_3$	0.12 M	100	24	99	86	S8
MnO_2	1 MPa O_2	3 equiv. $NaHCO_3$	0.12 M	100	24	>99	91	S8
$Mn_{0.75}Fe_{0.25}$	0.8 MPa O_2	4 equiv. NaOH	0.40 M	90	24	93	29.8	S9
Activated MnO_2	1 MPa O_2	3 equiv. $NaHCO_3$	0.12 M	100	24	99	74	S8
MnO_2	1 MPa O_2	3 equiv. $NaHCO_3$	0.12 M	100	24	99	91	S10
$MnCo_2O_4$	1 MPa O_2	3 equiv. $KHCO_3$	0.14 M	100	24	99.5	70.9	S11
$SrMnO_3$	1 MPa O_2	3 equiv. $NaHCO_3$	0.12 M	100	24	99	58	S10
amor-MnO_2	1 MPa	3 equiv. $NaHCO_3$	0.12 M	100	24	100	92	S2
Ni-MnO_x	0.8 MPa O_2	4 equiv. $NaHCO_3$	0.40 M	100	28	100	93.8	S12
CoOx-MC	0.5 MPa O_2	3.6 equiv. K_2CO_3	0.048 M	80	30	98.3	95.3	S13

Table S2 Pore properties for the fresh and recycled CoBi-12

CoBi-12	BET surface area ($m^2\ g^{-1}$)	Pore volume ($cm^3\ g^{-1}$)	Average pore size (nm)
Fresh	44.98	0.195	14.74
Recycled	40.29	0.193	16.14

References：

S1. Z. Miao, Y. Zhang, X. Pan, T. Wu, B. Zhang, J. Li, T. Yi, Z. Zhang and X. Yang, *Catal. Sci. Technol.*, 2015, **5**, 1314-1322.

S2. Y. Wen, Y. Zhang, L. He, H. Li, Z. Zhuang and Y. Yu, ACS Appl. Nano Mater., 2022, **5**, 11559-11566.

S3. A. C. Chen, T. T. Li, Q. Zhang and H. Zhu, *Catal. Sci. Technol.*, 2022, **12**, 2954-2961.

S4. K. T. V. Rao, J. L. Rogers, S. Souzanchi, L. Dessbesell, M. B. Ray and C. Xu, *ChemSusChem*, 2018, **11**, 3323-3334.

S5. X. Han, C. Li, X. Liu, Q. Xia and Y. Wang, *Green Chem.*, 2017, **19**, 996-1004.

S6. X. Wan, N. Tang, Q. Xie, S. Zhao, C. Zhou, Y. Dai and Y. Yang, *Catal. Sci. Technol.*, 2021, **11**, 1497-1509.

S7. L. Bao, F.Z. Sun, G.Y. Zhang and T.L. Hu, ChemSusChem, 2020, 13, 548-555.

S8. E. Hayashi, Y. Yamaguchi, K. Kamata, N. Tsunoda, Y. Kumagai, F. Oba and M. Hara, *J. Am. Chem. Soc.*, 2019, **141**, 890-900.

S9. F. Neațu, R. S. Marin, M. Florea, N. Petrea, O. D. Pavel and V. I. Pârvulescu, *Appl. Catal. B: Environ.*, 2016, **180**, 751-757.

S10. E. Hayashi, T. Komanoya, K. Kamata and M. Hara, *ChemSusChem*, 2017, **10**, 654-658.

S11. S. Zhang, X. Sun, Z. Zheng and L. Zhang, *Catal. Commun.*, 2018, **113**, 19-22.

S12. K. Yu, Y. Liu, D. Lei, Y. Jiang, Y. Wang, Y. Feng, L.L. Lou, S. Liu and W. Zhou, *Catal. Sci. Technol.*, 2018, **8**, 2299-2303.

S13. X. Liu, M. Zhang and Z. Li, *ACS Sustainable Chem. Eng.*, 2020, **8**, 4801-4808.