

## Supplementary Material

# Catalytic Conversion of Glycerol to Methyl Lactate over Au-CuO/Sn-Beta: The Roles of Sn-Beta

Ying Duan <sup>1</sup>, Qianqian Luo <sup>2</sup>, Renfeng Nie <sup>2</sup>, Jianshe Wang <sup>2</sup>, Yongsheng Zhang <sup>2</sup>, Tianliang Lu <sup>2,\*</sup> and Chunbao Xu <sup>3,\*</sup>

<sup>1</sup> College of Food and Drug, Luoyang Normal University, Luoyang, 471934, China; duanying@mail.ustc.edu.cn

<sup>2</sup> School of Chemical Engineering, Zhengzhou University, Zhengzhou, 450001, China; luoqianqian2022@163.com (Q.L.); refinie@163.com (R.N.); jianshewang@zzu.edu.cn (J.W.); yongshengzhang001@163.com (Y.Z.)

<sup>3</sup> Department of Chemical and Biochemical Engineering, Western University, 1151 Richmond St., London, ON N6A 3K7, Canada

\* Correspondence: lutianliang@zzu.edu.cn (T.L.); cxu6@uwo.ca (C.X.)

**Abstract:** The production of methyl lactate as a degradable polymer monomer from biomass was an important topic for a sustainable society. In this manuscript, glycerol was oxidated to methyl lactate catalyzed by the combination of Au-CuO and Sn-Beta. The influence of Sn content, Sn source, and the preparation conditions for Sn-β was studied. The Au content in Au/CuO was also investigated by varying the Au content in Au/CuO. The catalysts were characterized by XRD, FTIR spectroscopy of pyridine adsorption, and TEM to study the role of Sn and the influence of different parameters for catalyst preparation. After the optimization of reaction parameters, the yield of methyl lactate from glycerol reached 59% at 363 K after reacting in 1.6 MPa of O<sub>2</sub> for 6 h.

**Keywords:** glycerol; oxidation; methyl lactate; Sn-Beta; Au/CuO

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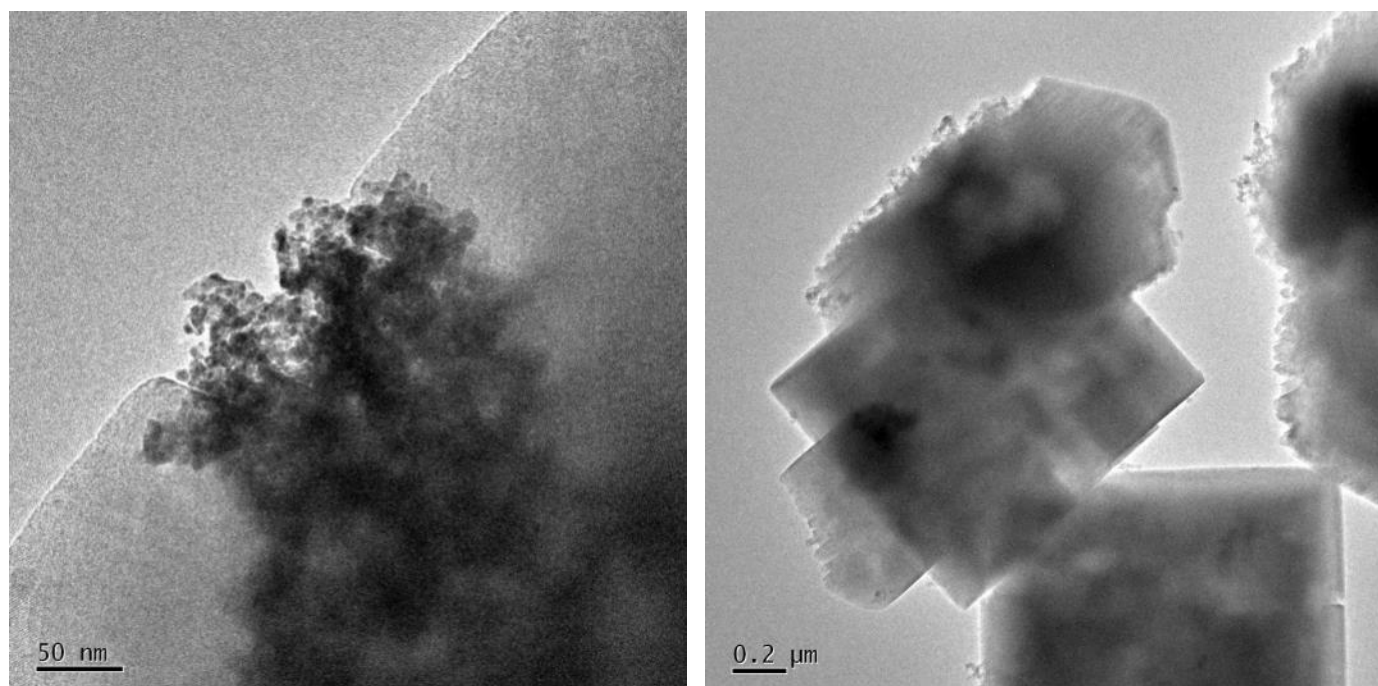


Figure S1. TEM image of 1Au/4CuO-Sn- $\beta$ .

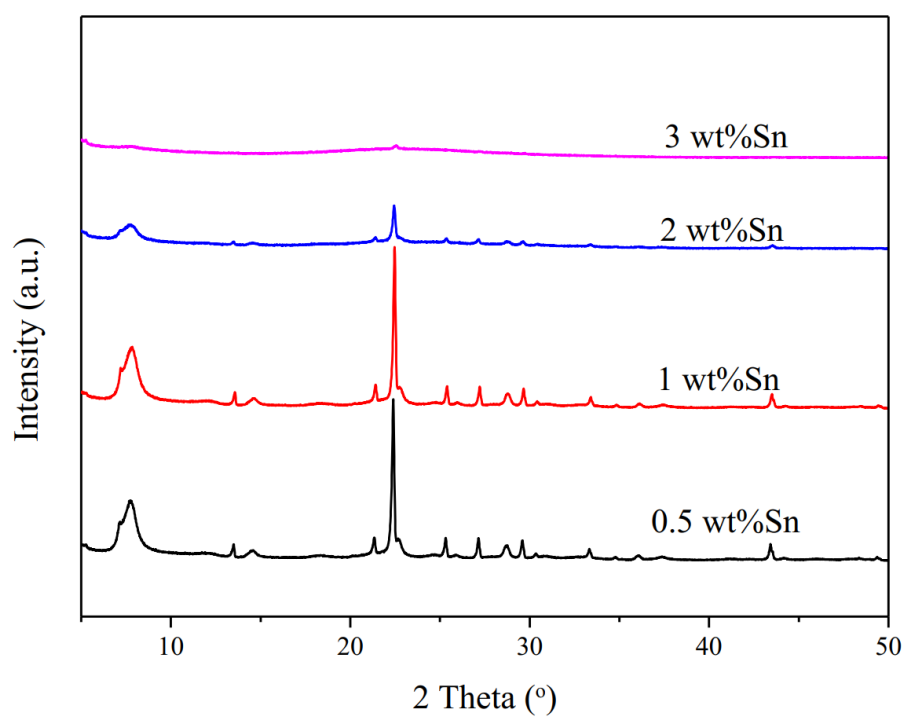


Figure S2. The XRD patterns of Sn- $\beta$ -Cl prepared the content of H<sub>2</sub>O at H<sub>2</sub>O/SiO<sub>2</sub> = 7.5.

**Table S1.** Effects of SnCl<sub>4</sub> as Tin Source on the Catalytic Performance.

Sn (wt%)	Conversion of GLY(%)	Yield of MLA (%)	Yield of GLR (%)	Yield of MP (%)	Sele of MLA(%)
0	97	3	24	5	3
0.5	96	36	28	1	38
1	94	50	19	1	53
2	92	55	17	1	60
3	96	42	25	1	44

Reaction condition: glycerol (1 mmol), methanol (5 mL), 1Au/9CuO (0.0180g), Sn-β or Al-β (0.1000g), O<sub>2</sub> (1.6 MPa), 363 K, 4 h.

**Table S2.** Effect of SnC<sub>2</sub>O<sub>4</sub> as Sn source and Sn content on catalytic performance.

Sn (wt%)	Conversion of GLY(%)	Yield of MLA (%)	Yield of GLR (%)	Yield of MP (%)	Sele of MLA(%)
0.5	95	38	27	1	40
1	93	42	24	1	45
2	94	52	17	1	55
3	95	48	21	1	51

Reaction condition: glycerol (1 mmol), methanol (5 mL), 1Au/9CuO (0.0180g), Sn-β (0.1000g), O<sub>2</sub> (1.6 MPa), 363 K, 4 h.

**Table S3.** Effect of C<sub>12</sub>H<sub>20</sub>O<sub>4</sub>Sn as tin source and Sn content on catalytic performance.

Sn (wt%)	Conversion of GLY(%)	Yield of MLA (%)	Yield of GLR (%)	Yield of MP (%)	Sele of MLA(%)
0.5	97	15	31	12	15
1	93	30	25	11	32
2	96	48	22	1	50
3	98	19	21	17	19

Reaction condition: glycerol (1 mmol), methanol (5 mL), 1Au/9CuO (0.0180g), Sn-β (0.1000g), O<sub>2</sub> (1.6 MPa), 363 K, 4 h.

**Table S4.** Effect of amplified synthesis of Sn-β on the catalytic performance. .

Catalyst	Conversion of GLY(%)	Yield of MLA (%)	Yield of GLR (%)	Sele of MLA(%)
Small-scale	89	56	16	63
50 times scale	92	53	18	58

Reaction condition: glycerol (1 mmol), methanol (5 mL), 1Au/9CuO (0.0180g), Sn-β (0.1000g), O<sub>2</sub> (1.6 MPa), 363 K, 4 h.