

Supplementary Material

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

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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 O₂ for 6 h.

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

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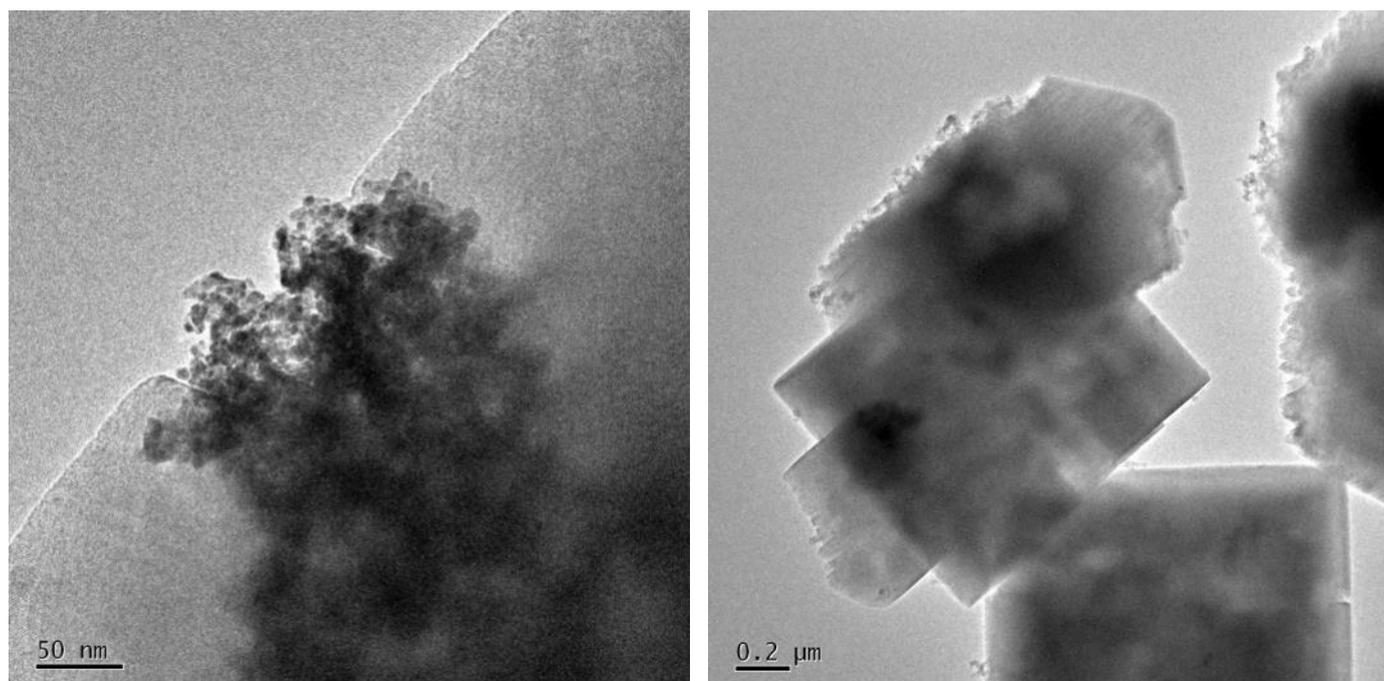


Figure S1. TEM image of 1Au/4CuO-Sn- β .

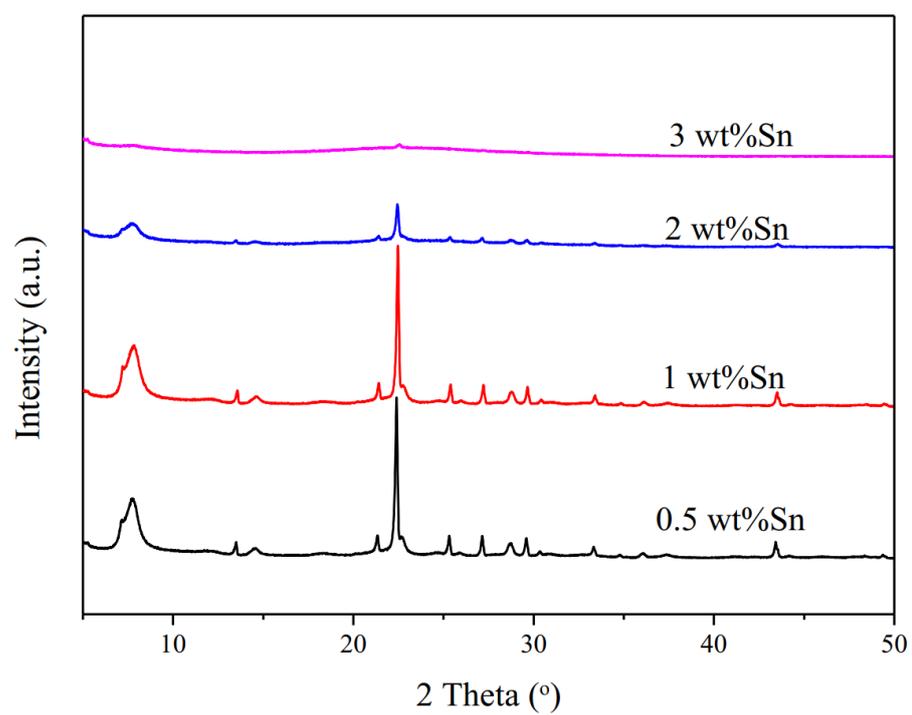


Figure S2. The XRD patterns of Sn- β -Cl prepared the content of H₂O at H₂O/SiO₂ = 7.5.

Table S1. Effects of SnCl₄ 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), O₂ (1.6 MPa), 363 K, 4 h.

Table S2. Effect of SnC₂O₄ 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), O₂ (1.6 MPa), 363 K, 4 h.

Table S3. Effect of C₁₂H₂₀O₄Sn 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), O₂ (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), O₂ (1.6 MPa), 363 K, 4 h.