Supplementary Information

Highly selective transformation of glycerol to dihydroxyacetone without using oxidants by PtSb/C-catalyzed electrooxidation process

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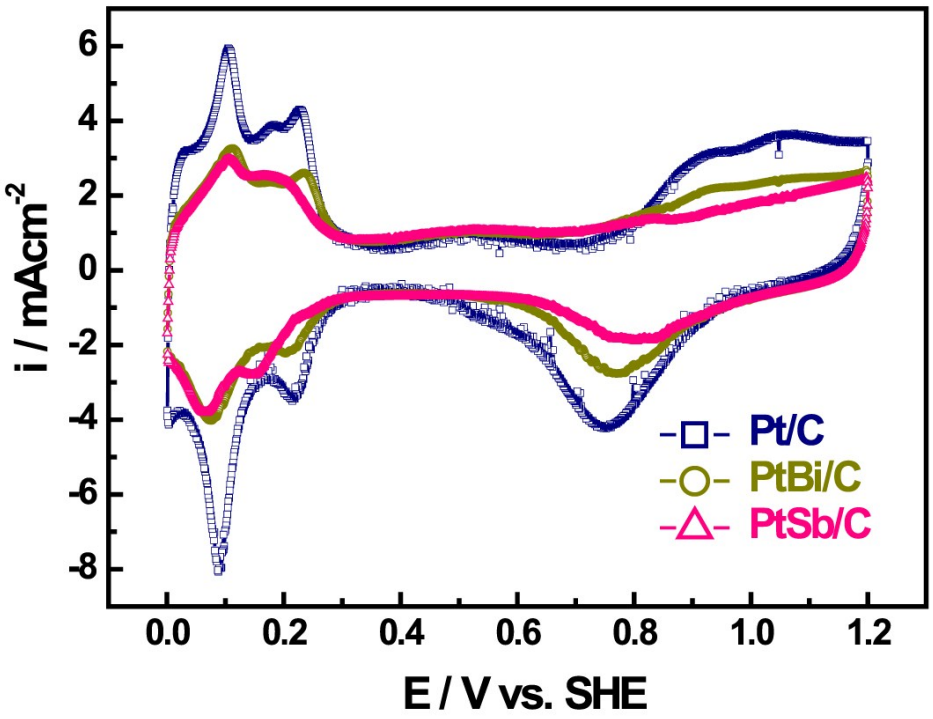

Fig. S1 CVs of the Pt/C, PtBi/C, and PtSb/C catalysts in a 0.5 M H_2SO_4 electrolyte at a 50 mV/s scan rate at room temperature. The current densities were normalized to the geometric area of the working electrode (with a 0.07 cm^2 geometric area and 0.1 mg cm^{-2} metal loading).

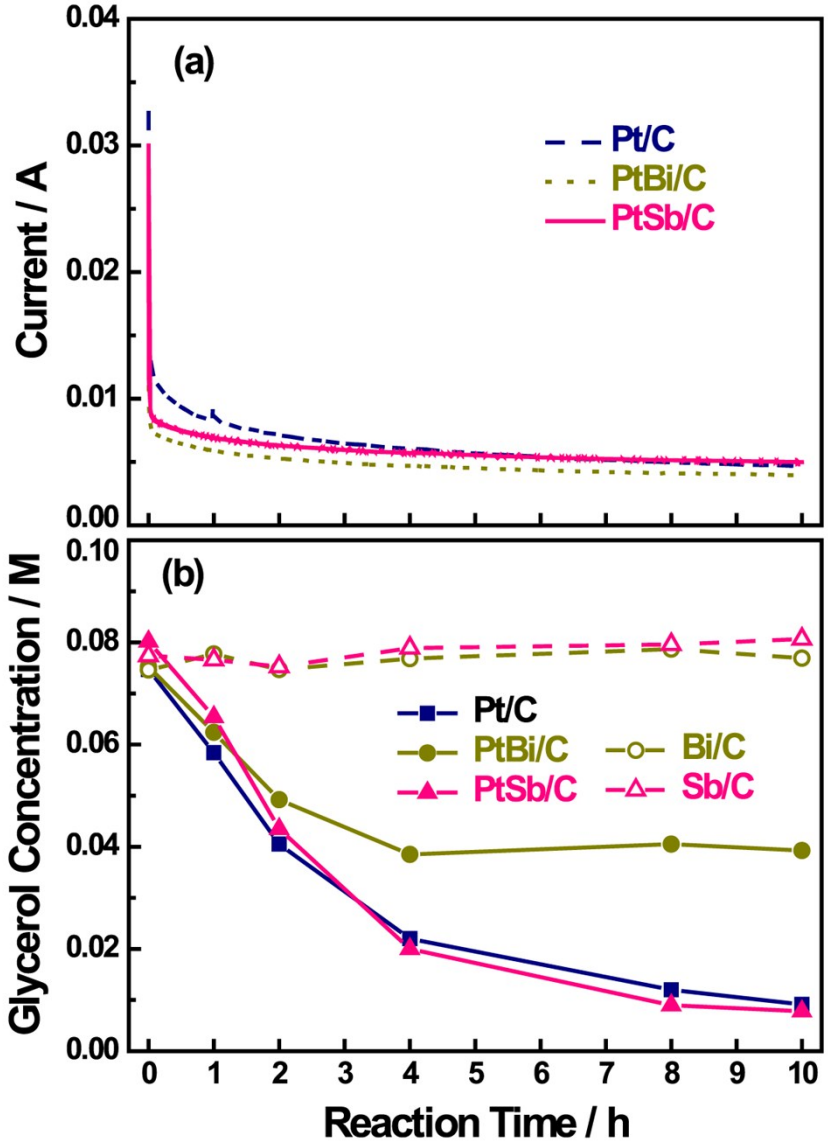

Fig. S2 (a) Current-time plots and (b) glycerol concentration as a function of reaction time over the Pt/C, PtBi/C, PtSb/C, Bi/C, and Sb/C catalysts. [Reaction conditions: 0.1 M glycerol, Anode applied potential: 0.797 V, Reaction temperature: 60 °C]

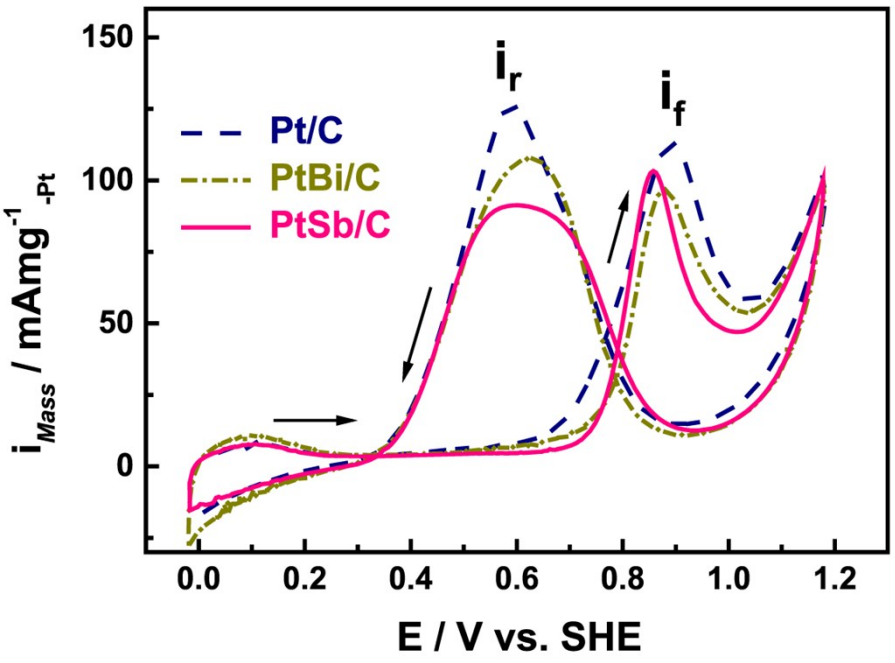

Fig. S3 CVs of the Pt/C, PtBi/C, and PtSb/C catalysts in 0.5 M H_2SO_4 with 2 M glycerol at a 50 mV s^{-1} scan rate at room temperature. The current densities were normalized the Pt mass.

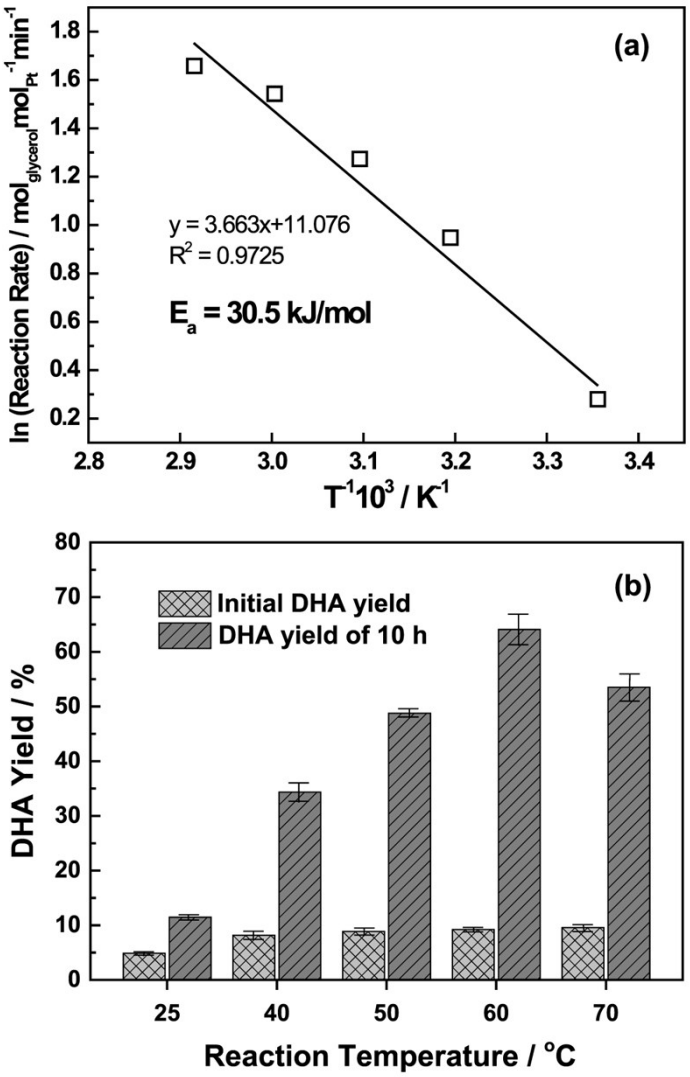

Fig. S4 (a) Arrhenius plot and (b) DHA yield data as a function of reaction temperatures over the PtSb/C catalysts. [Reaction conditions: 0.1 M glycerol, 0.797 V]

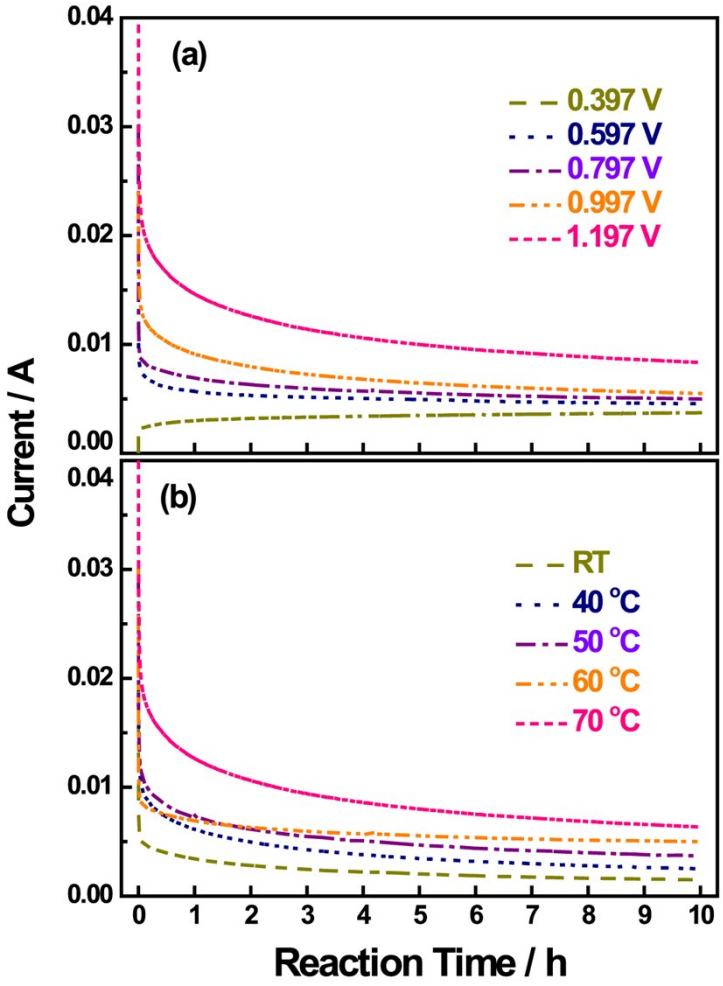

Fig. S5 Current-time plots for the electrooxidation of glycerol over the PtSb/C catalysts with various (a) anode applied potentials and (b) reaction temperatures. [Reaction conditions: (a) 0.1 M glycerol, 60 °C; (b) 0.1 M glycerol, 0.797 V]

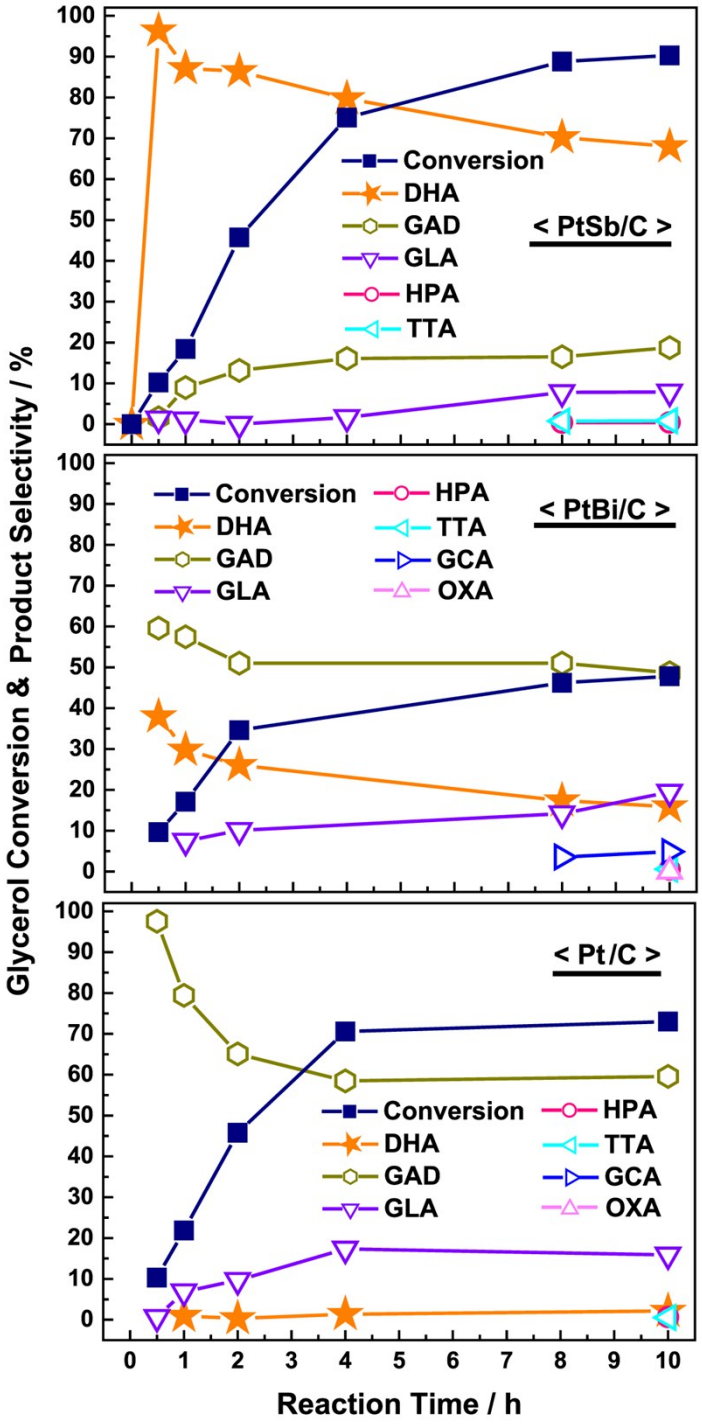

Fig. S6 Time-on-stream data for glycerol oxidation over the Pt/C, PtBi/C, and PtSb/C catalysts. [Reaction conditions: 0.1 M glycerol, 0.797 V, 60 °C]

Table S1. Effect of the electrode potential on electrocatalytic glycerol oxidation at 60 °C for 10 h

	Carbon Balance (%)[a]		
Applied Potential (V vs. SHE)	Pt/C	PtBi/C	PtSb/C
0.397 V	97.0	87.8	99.3
0.597 V	92.1	87.3	98.7
0.797 V	83.0	91.4	97.9

[a] Carbon balance was determined based on the observed C_2 and C_3 products in the liquid phase.

Table S2. Conversion results for the GAD, DHA, and GLA substrates over the PtSb/C catalysts[a]

Feedstock	Reaction Condition	Conversion (%)	Selectivity (%)				
			GLA	HPA	TTA	GCA	OXA
GAD	0.797 V, 10 h	72.7	81.5	6.6	5.7	0.0	0.0
	1.197 V, 5 h	84.6	69.5	0.0	0.0	26.9	0.0
	1.197 V, 10 h	92.9	59.0	0.0	0.0	30.0	0.4
DHA	0.797 V, 10 h	53.3	0.0	28.6	0.0	56.7	8.8
	1.197 V, 10 h	57.2	0.0	19.7	0.0	65.8	7.8
GLA	0.797 V, 5 h	80.3	-	2.3	2.8	63.2	10.1
	1.197 V, 5 h	81.6	-	1.1	2.7	72.5	9.9

[a] Electrooxidation was obtained using a 0.1 M feedstock with 0.5 M H_2SO_4 at 60 °C. Feedstock/Pt molar ratio= 617. The conversion and product selectivity of GAD, DHA, and GLA were calculated according to the C_2 and C_3 products in the liquid phase.