Supplementary Information



Figure S1. NH₃-TPD curves of Al₂O₃, 10% Nb₂O₅/nano-Al₂O₃, Nb₂O₅, and a series of Nb/Al oxide catalysts.



Figure S2.FTIR spectra of pyridine adsorption of Al₂O₃, Nb₂O₅, and 20% Nb/Al oxide.



Figure S3. (A₁ and A₂) Catalytic conversion of glucose and fructose to LA with different metal oxide catalysts (2.0 g sugar, 30 mL H₂O, 5 wt% catalyst, 453 K, 10 min); (B₁ and B₂) Catalytic conversion of glucose and fructose to LA over Nb/Al oxides with different Nb loadings (2.0 g sugar, 30 mL H₂O, 5 wt% catalyst, 453 K, 10 min); (C₁ and C₂) Effect of reaction temperature on catalytic conversion of glucose and fructose to LA over 20% Nb/Al oxide (2.0 g sugar, 30 mL H₂O, 5 wt. % catalyst, 10 min); (D) Effect of 20% Nb/Al oxide dosage on catalytic conversion of glucose and fructose to LA (2.0 g sugar, 30 mL H₂O, 473 K (D₁) and 463K (D₂), 10 min); (E) Effect of reaction time on catalytic conversion of glucose to LA oxide (2.0 g sugar, 30 mL H₂O, 473 K (E₁) and 463 K (E₂)).



Figure S4.Thermogravimetric analysis of 10%Nb/Nano-Al₂O₃, 10%Nb/Al, Al₂O₃, and Nb₂O₅ precursors.

Table S1. Distributing of Brønsted andLewis acid concentrations (mmol/g) of catalyst sampls.

Concentration	Brønsted	Lewis	Dation of Pronstad to Lowis
Samples	(mol/g)		Ration of Dignsteu to Lewis
20% Nb/Al	0.0071	0.0293	0.24
10% Nb/Al	0.0051	0.0243	0.21
Nb_2O_5	0.0030	0.0180	0.17
Al ₂ O ₃	0.0022	0.0234	0.09

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