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Electronic Supplementary Information for

Glucose production from saccharides using layered transition metal oxide and exfoliated nanosheets as a water-tolerant solid acid catalyst

Atsushi Takagaki, Caio Tagusagawa, and Kazunari Domen*

Department of Chemical System Engineering, School of Engineering, The University of Tokyo, 7-3-1 Hongo, Bunkyo-ku, Tokyo 113-8656, Japan

Content

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Experimental:

Catalyst Preparation

$LiNbMoO_6$ was obtained by calcination of a stoichiometric mixture of Li_2CO_3, Nb_2O_5, and MoO_3 at 853 K for 24 h with one intermediate grinding. The proton-exchange reaction was carried out by shaking the Li form in 1 M HNO_3 at room temperature for 1 week.

$HTiNbO_5$ nanosheets were prepared by exfoliation – aggregation of layered $HTiNbO_5$. Exfoliated $TiNbO_5^-$ sheets were obtained by adding 15 wt% tetra(*n*-butylammonium)hydroxide (TBA^+OH^-) solution to 150 mL of distilled water containing 2.0 g of layered $HTiNbO_5$. The suspension was then centrifuged, and the supernatant solution was collected. The addition of dilute HNO_3 aqueous solution to 30 mL of the nanosheet solution resulted in immediate random aggregation of the nanosheets as a precipitate. The aggregated samples was washed with water and dried in air.

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Table S1: Hydrolysis of starch over $HNbMoO_6$[a]

Amount of starch / g	Amount of water / mL	Reaction time /h	Yields of products /mmol			Turnover number
			Glucose	Fructose	Hydroxymethyl furfural	
0.1	5	15	0.116	n.d.	n.d.	0.31
0.1	5	72	0.249	n.d.	0.136	1.01
0.1	2	15	0.170	0.053	0.238	1.21
0.2	2	15	0.324	0.033	0.191	1.44

[a] Reaction conditions: starch (0.1 or 0.2g), H_2O (2 or 5 mL), catalyst (0.2g), 373 K.

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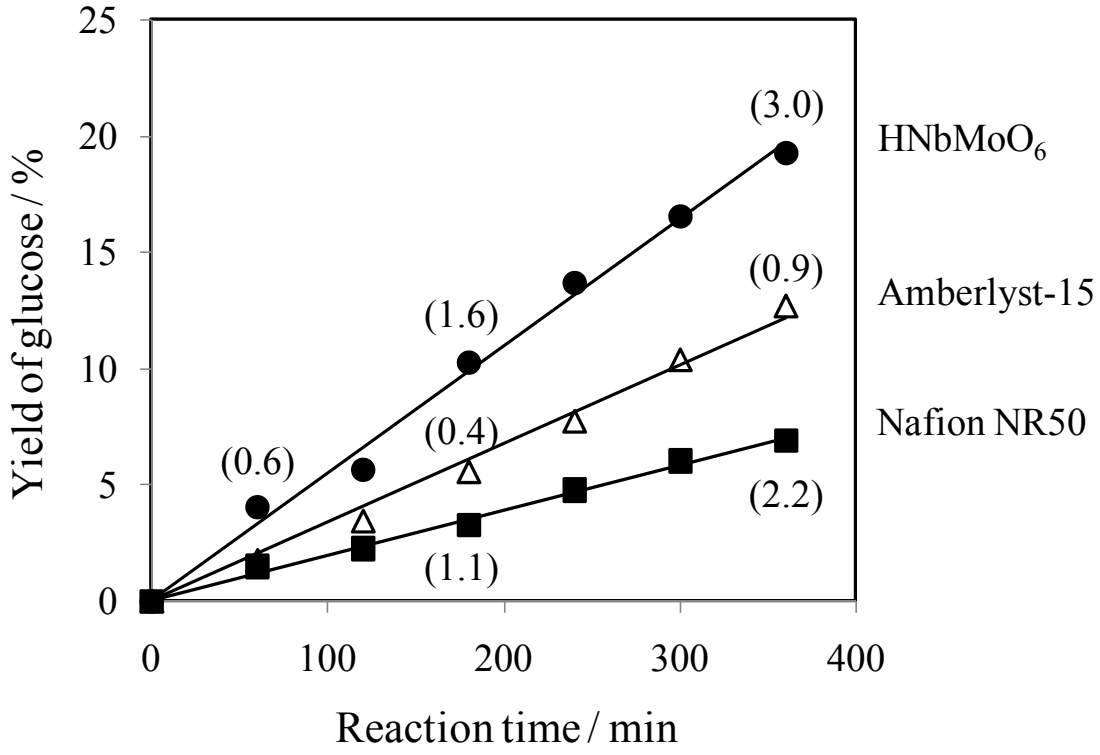

Figure S1: Time courses of cellobiose hydrolysis over layered $HNbMoO_6$, Amberlyst-15 and Nafion NR50. Values in parentheses are turnover number.

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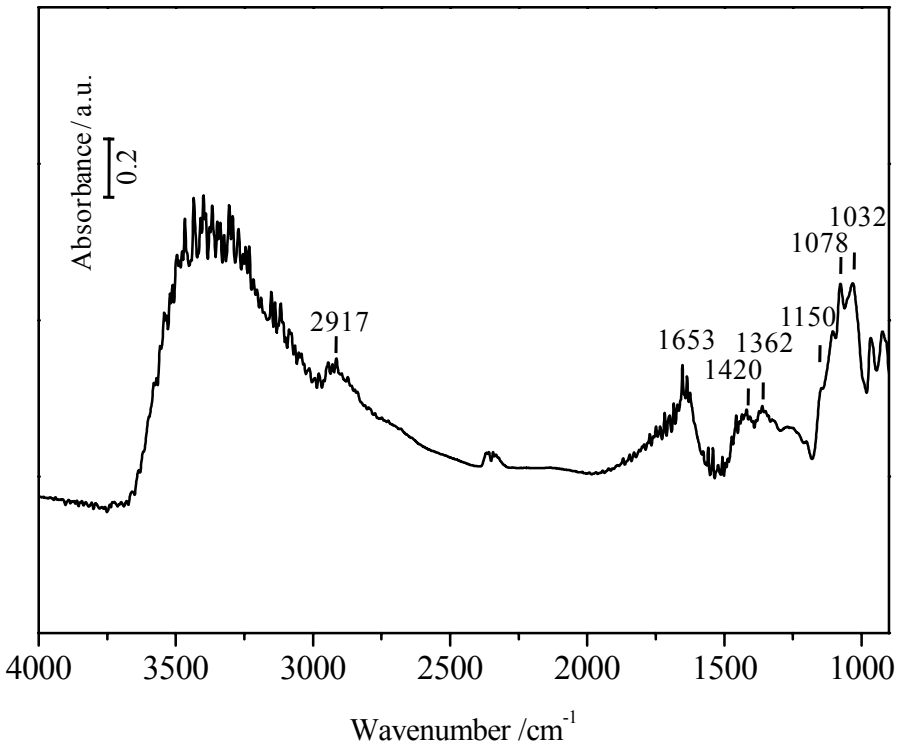

Figure S2: FT-IR spectrum for glucose-intercalated $HNbMoO_6$.
Assignments: 2917 cm^{-1} (C-H stretch), 1420 cm^{-1} (CH deformation), 1362 cm^{-1} (CH deformation), 1150 cm^{-1} (C-O stretch), 1078 cm^{-1} (CO/CC stretch), 1032 cm^{-1} (CO/CC stretch)