Supporting Information For

One-step Hydrogenation-Esterification of Aldehyde and Acid to Ester over Bifunctional Pt Catalysts: A Model Reaction as Novel Route for Catalytic Upgrading of Fast Pyrolysis Bio-oil

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Supplementary Figure

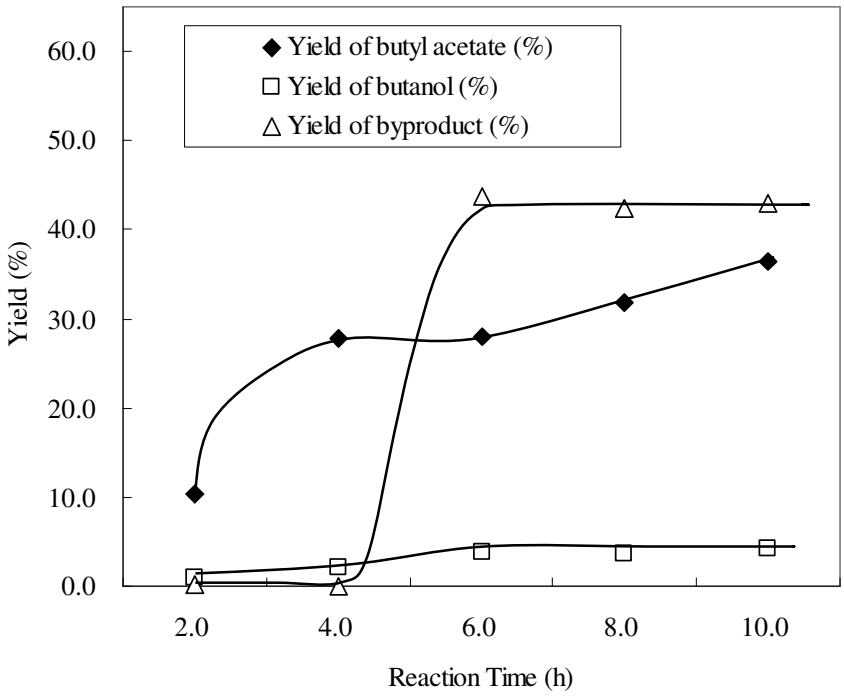

Fig. S1 Effect of reaction time on the yield of product from OHE reaction of butyl aldehyde and acetic acid over 5%Pt/$Al_2(SiO_3)_3$.

Supplementary Tables

Table S1. Effect of reaction time on the yield of product from OHE reaction of butyl aldehyde and acetic acid over 5%Pt/$Al_2(SiO_3)_3$.

Reaction Time	C_B [b]	Selectivity (%) [c]			Yield (%)		
(h)	(%)	BA	BU	BP	BA	BU	BP
2	11.4	90.6	7.8	1.6	10.3	0.9	0.2
4	30.0	92.8	6.9	0.3	27.9	2.1	0.1
6	75.5	37.2	5.0	57.8	28.0	3.8	43.7
8	77.9	40.7	4.8	54.5	31.7	3.7	42.5
10	83.5	43.6	5.1	51.3	36.4	4.2	42.9

[a] Conditions at constant: T_r=150 ^oC, P_H=15 atm, catalyst amount is 0.2 g, reagents amount is 18 g of butyl aldehyde and 15 g of acetic acid, stirring speed is 750 rpm

[b] Conversion of butyl aldehyde. [c] BA: butyl acetate, BU: butanol, BP: byproduct.

Table S2. Results of hydrogenation and esterification individually [a]

	Catalyst: 5%Pt/ $Al_2(SiO_3)_3$ (bifunctional)		Catalyst: $Al_2(SiO_3)_3$ (monofunctional)	
Reaction Type (Hydrogenation)[b]	Conversion of Aldehyde (%)	Selectivity of Hydrogenation (%)	Conversion of Aldehyde (%)	Selectivity of Hydrogenation (%)
Hydrogenation of Acetaldehyde [c]	16.7	87.0	——	——
Hydrogenation of butyl aldehyde	75.3	46.1	——	——
Reaction Type (Esterification)[d]	Conversion of Alcohol (%)	Selectivity of Esterification (%)	Conversion of Alcohol (%)	Selectivity of Esterification (%)
Esterification of ethanol and acetic acid	65.3	100	64.1	100
Esterification of butanol and acetic acid	58.8	100	57.7	100

[a] Conditions at constant: T_r=150 ^oC, P_H=15 atm, catalyst amount is 0.2 g, reaction time is 4 h, stirring speed is 750 rpm

[b] Reagents amount is 20 g

[c] Acetaldehyde is in the form of aqueous solution (40 wt% of acetaldehyde).

[d] Reagents amount is 40 g (the mole ratio of alcohol to acid is 1:1).