Synergistic effect of Lewis acid and base in modified Sn-β on direct conversion of levoglucosan to lactic acid

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Keywords: modified Sn-β, lactic acid, levoglucosan, synergistic effect

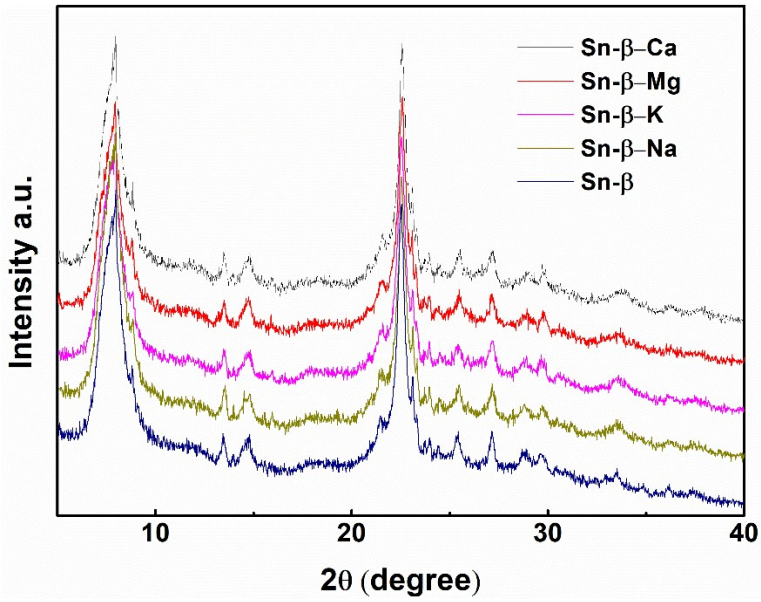

Figure S1. Powder XRD patterns of different zeolites.

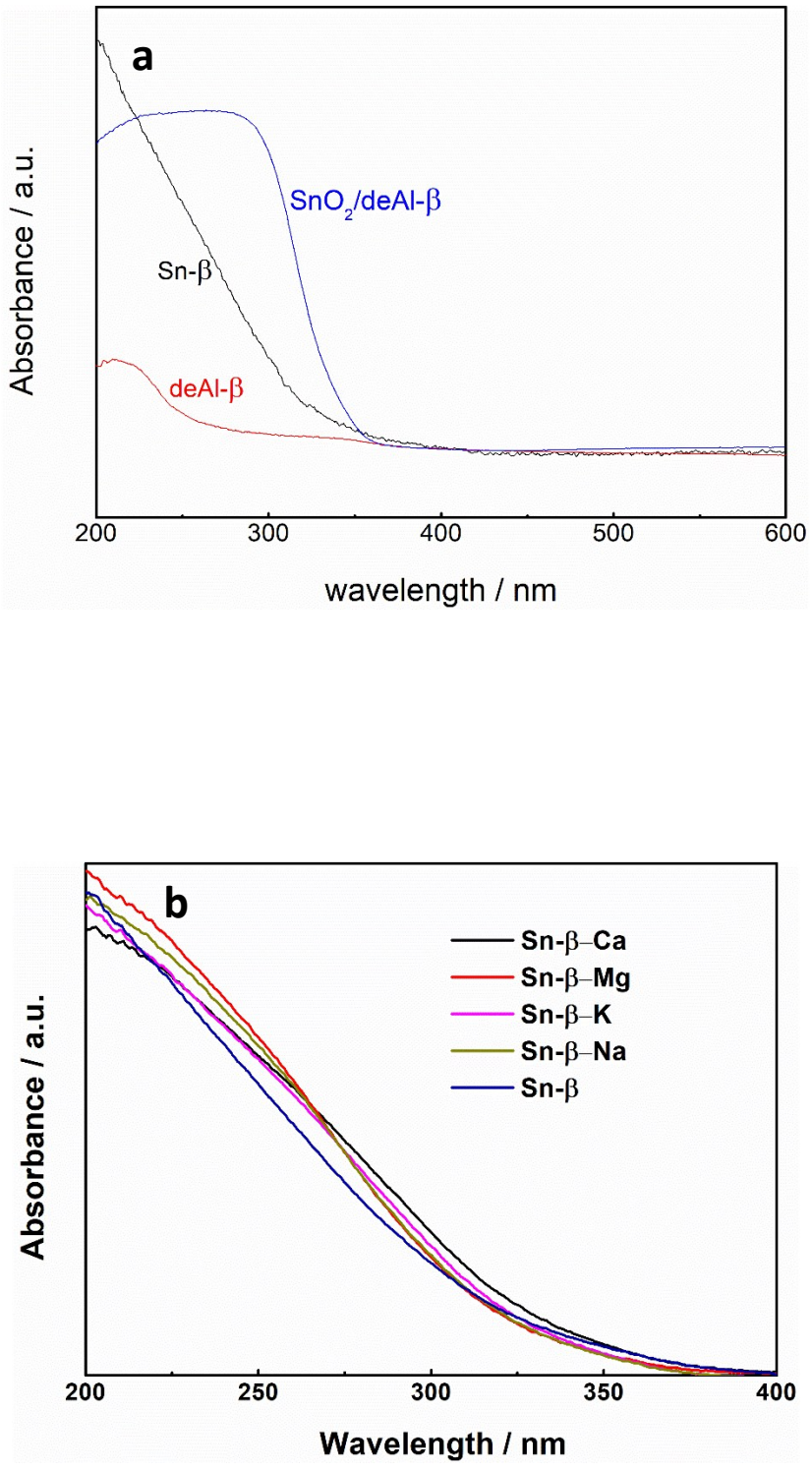

Figure S2. UV-Vis spectra of deAl-β, Sn-β and SnO_2/deAl-β(a) and cations modified Sn-β (b)

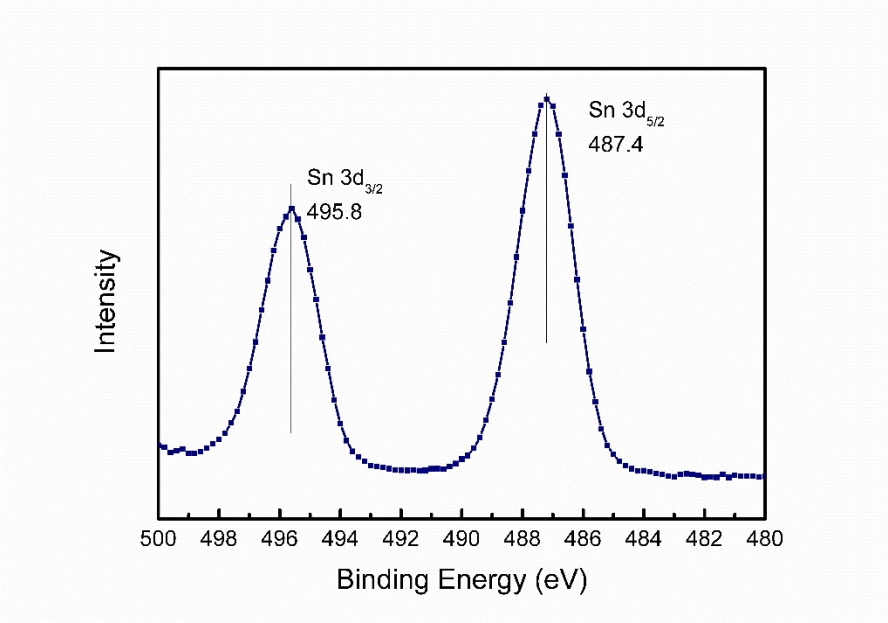

Figure S3. XPS of Sn-β sample.

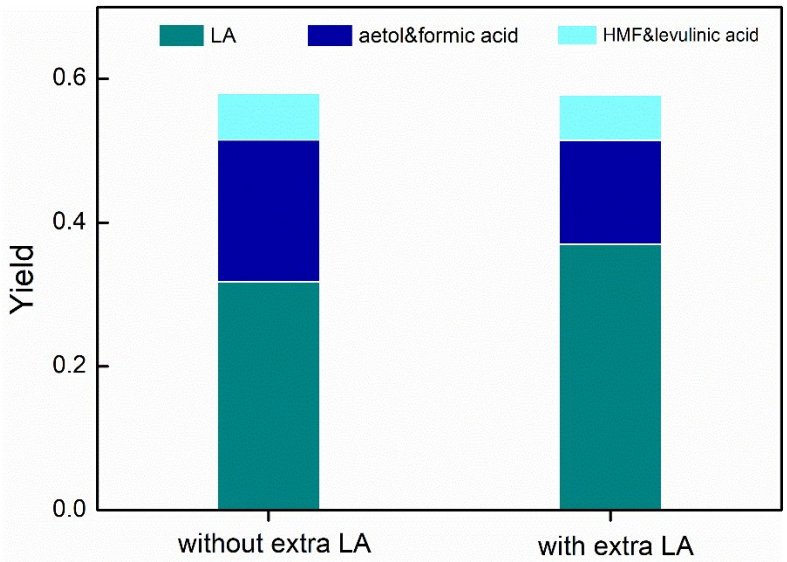

Figure S4. The effects of extra added lactic acid on the conversion of levoglucosan.

Reaction conditions: Sn-β 200 mg; lactic acid 0.2 mmol; levoglucosan 0.05 g; H_2O 20 mL; N_2 2 MPa; 190°C; time 6 h (without external LA); 2 h (with external LA).

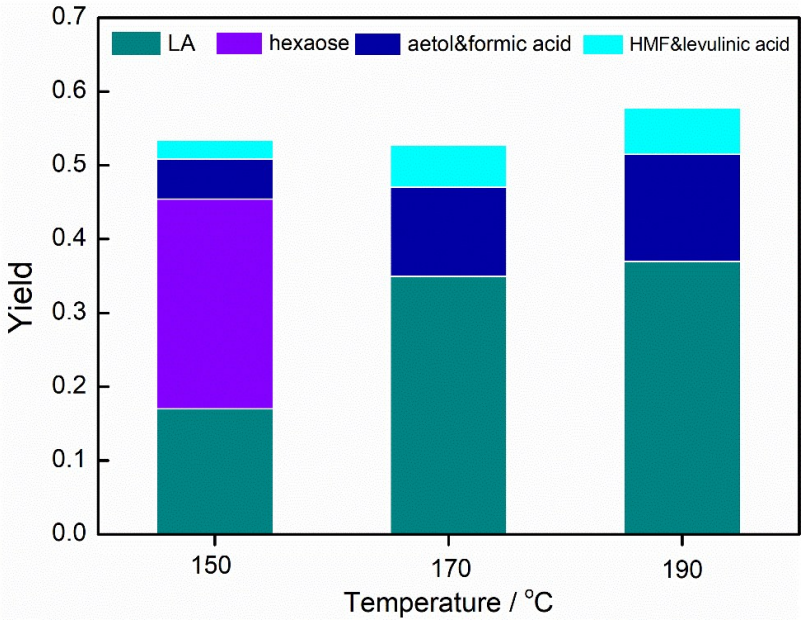

Figure S5. The effects of reaction temperature on the conversion of levoglucosan.

Reaction conditions: cat. 200 mg; lactic acid 0.2 mmol; levoglucosan 0.05 g; H_2O 20 mL; N_2 2 MPa;

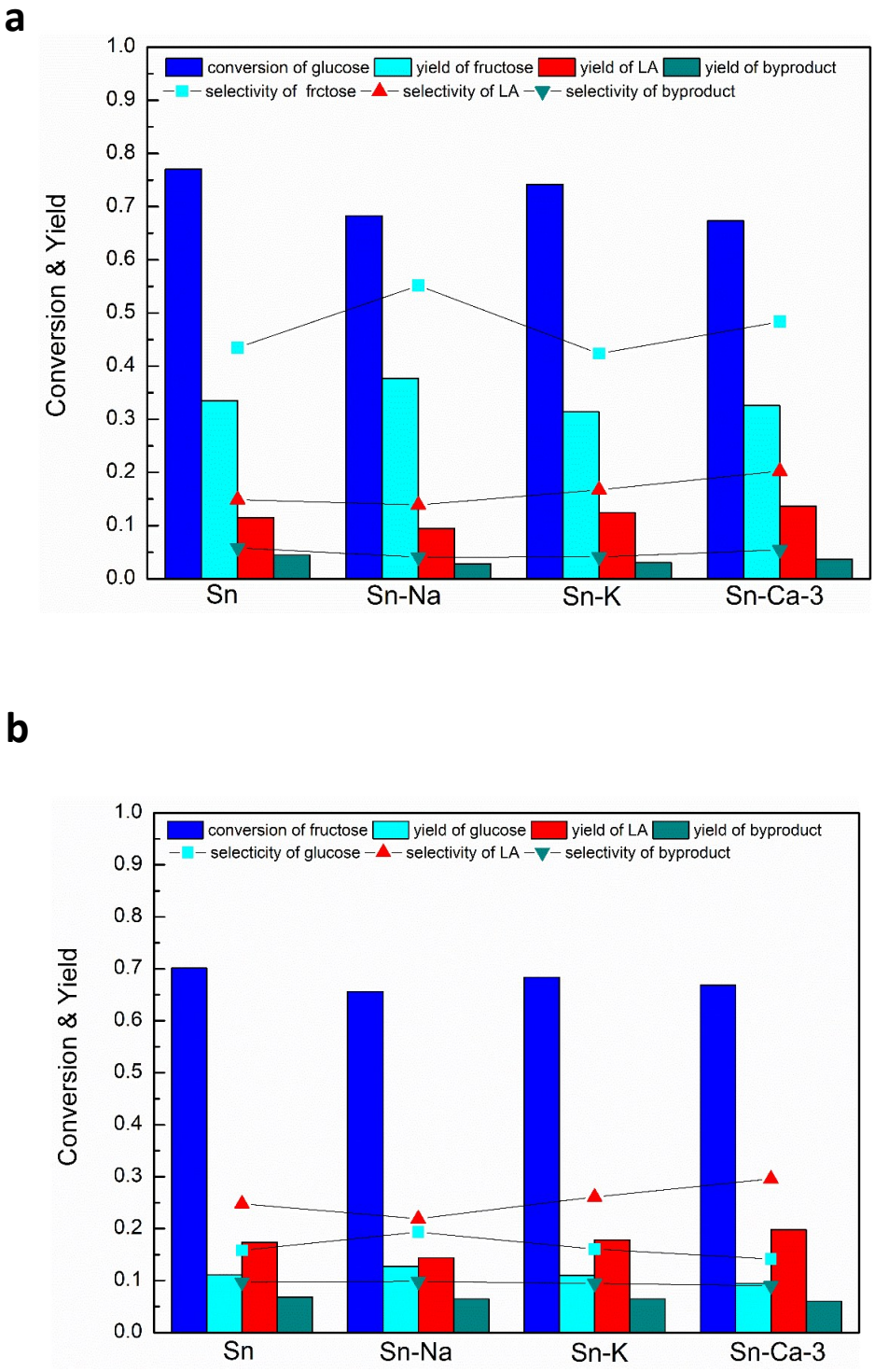

Figure S6. Conversion of glucose (a) and fructose (b) over ion-exchanged Sn-β.

Reaction conditions: cat. 100 mg; reactants 0.1 g; H_2O 20 mL; N_2 2 MPa; 150°C. Time 0.5 h.

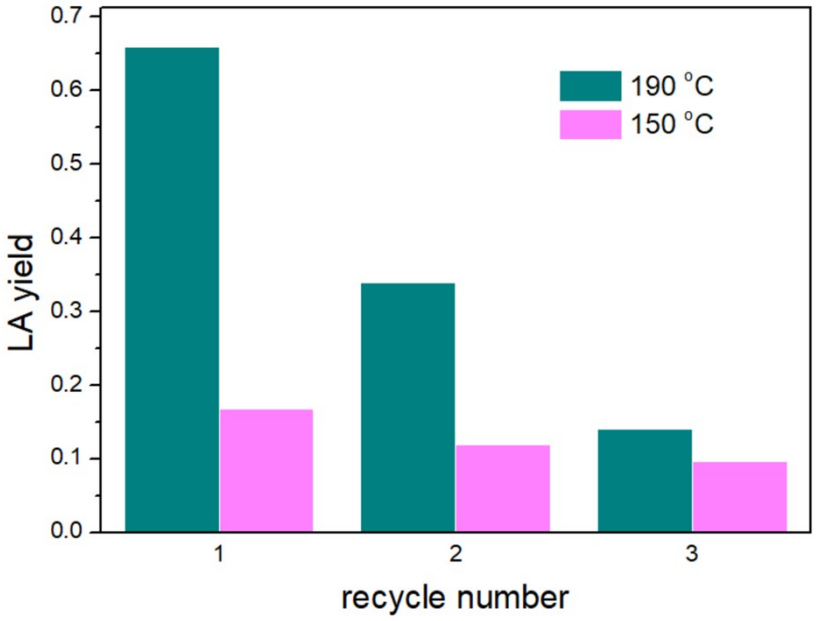

Figure S7. Recycling test of levoglucosan conversion to lactic acid over Sn-β-Ca-3 at different temperatures. Reaction conditions: cat. 300 mg; lactic acid 0.2 mmol; levoglucosan 0.05 g; H_2O 20 mL; N_2 2 MPa; time 2 h.

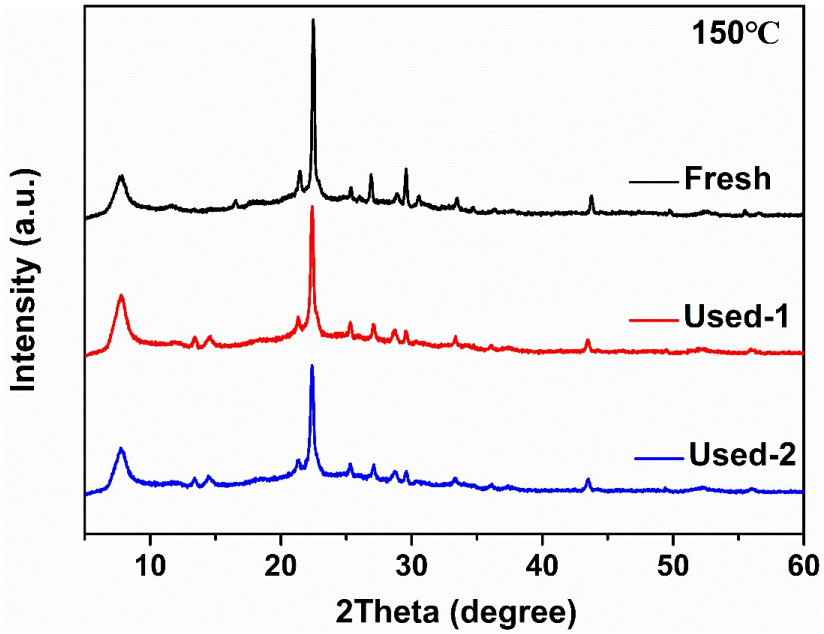

Figure S8. XRD patterns before and after levoglucosan conversion to lactic acid at 150 °C.