Supplementary information

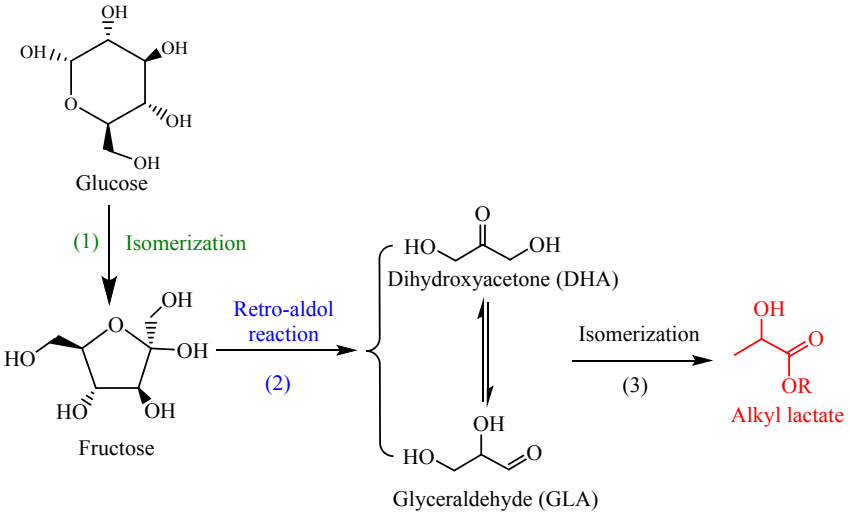
Promotion effect of Mg on post-synthesized Sn-Beta zeolite for the conversion of glucose to methyl lactate

Xiaomei Yang[a], Bin Lv[a], Tianliang Lu[b], Yunlai Su[a], Lipeng Zhou[a,*]

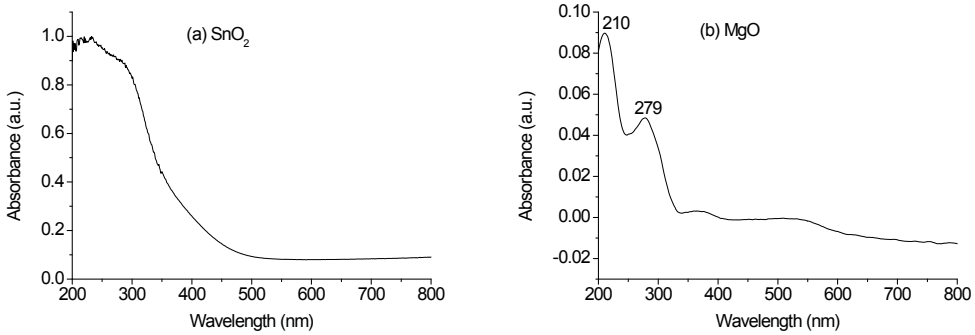
[a] Green Catalysis Center and College of Chemistry, Zhengzhou University, 100 Kexue Road, Zhengzhou 450001, China

[b] School of Chemical Engineering, Zhengzhou University, 100 Kexue Road, Zhengzhou 450001, China

* Corresponding author: zhoulipeng@zzu.edu.cn



Scheme S1 Conversion of glucose to alkyl lactate in alcohol.



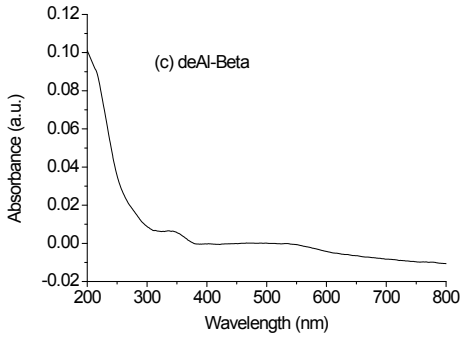


Fig. S1 UV-vis DR spectra of SnO_2, MgO and deAl-Beta.

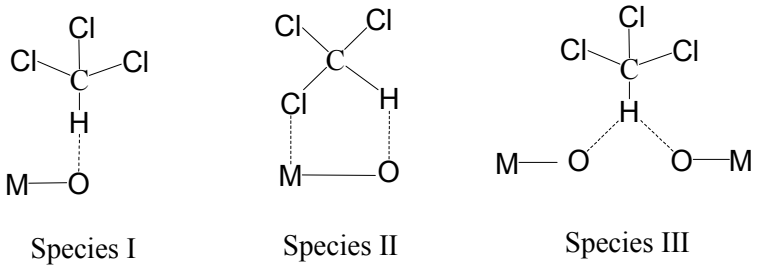
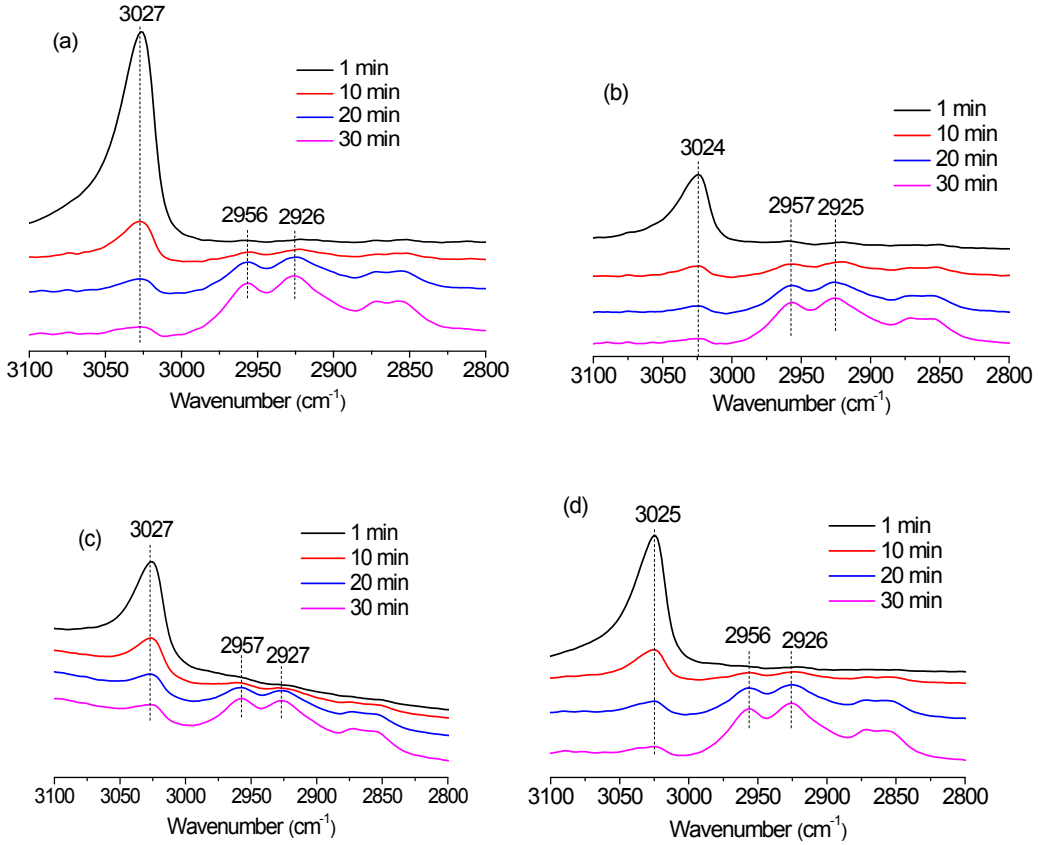


Fig. S2 Expected adsorbed $CHCl_3$ species on Lewis basic and Lewis acidic sites.[1,2]



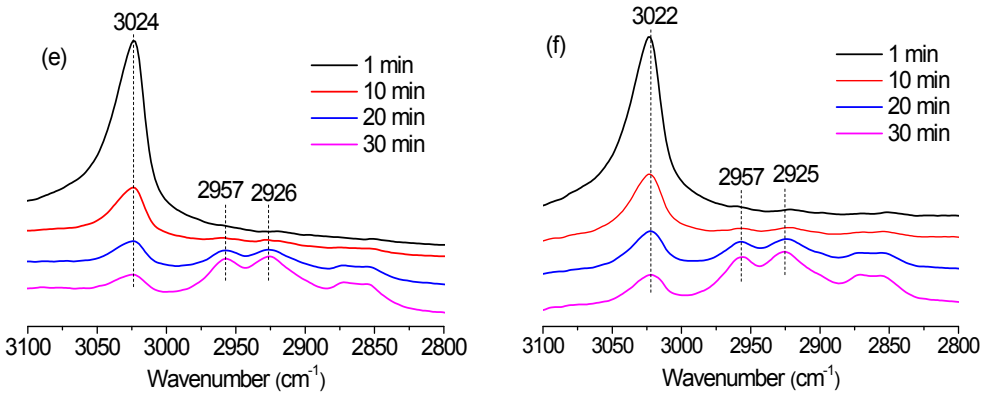
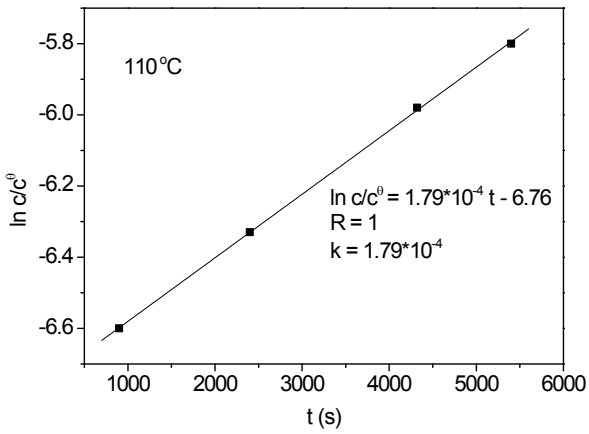
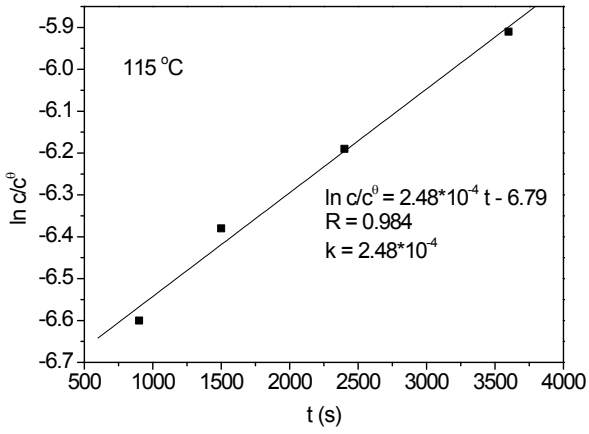


Fig. S3 FT-IR spectra of $CHCl_3$ adsorbed on (a) deAl-Beta, (b) Mg-Beta, (c) Sn-Beta, (d) 0.25Mg-Sn-Beta, (e) 1Mg-Sn-Beta and (f) 4Mg-Sn-Beta at room temperature with different desorption time.





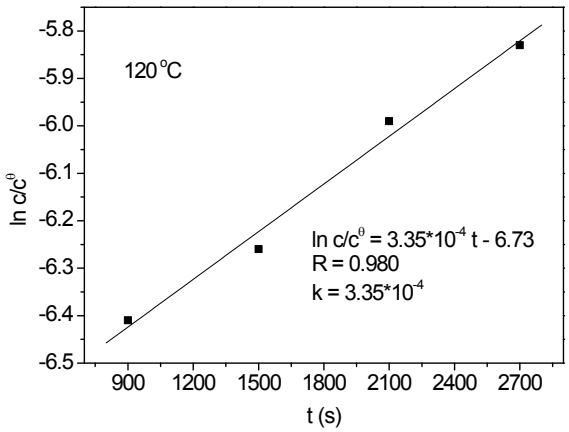
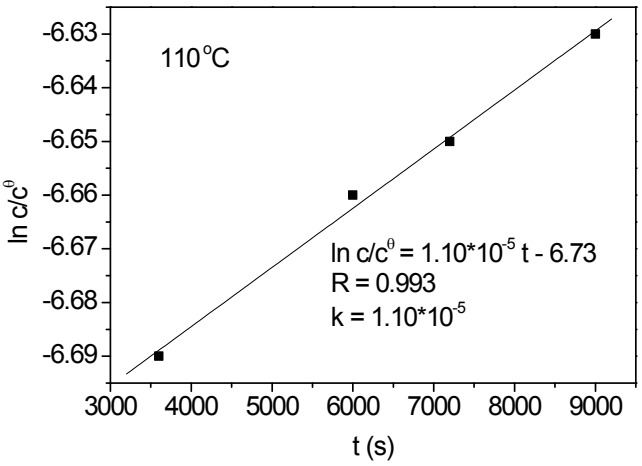
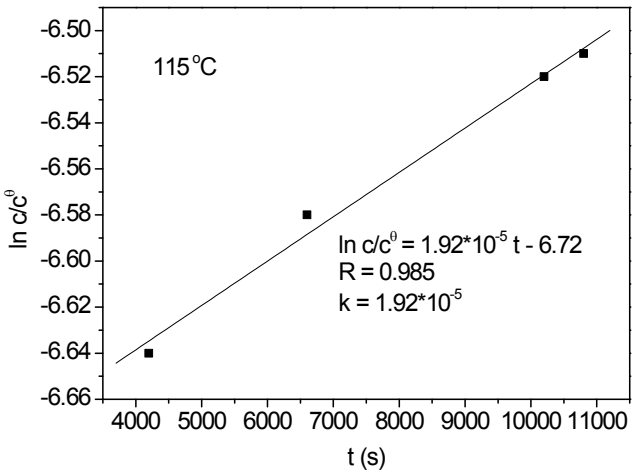


Fig. S4 Kinetic analysis of MLA formation from fructose in methanol in the presence of 1Mg-Sn-Beta.





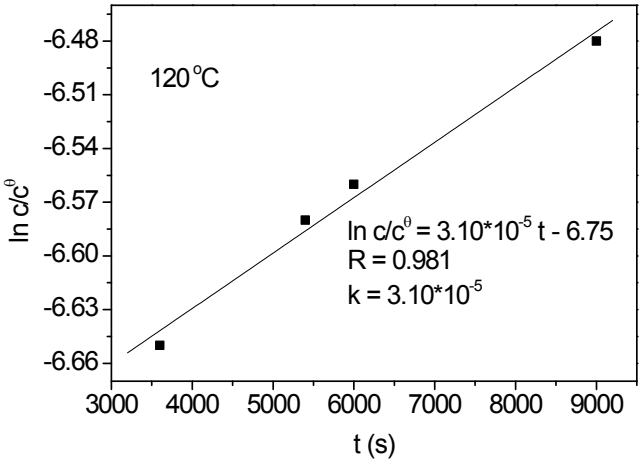


Fig. S5 Kinetic analysis of MLA formation from fructose in methanol in the presence of Sn-Beta.

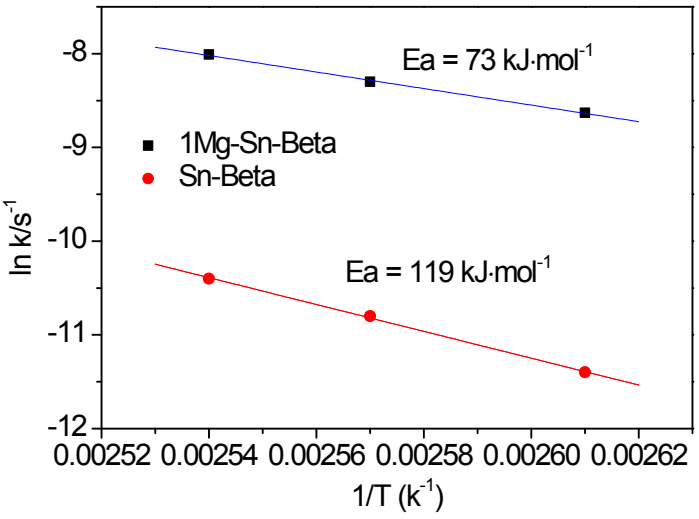


Fig. S6 Arrhenius plots of the retro-aldol of the fructose over 1Mg-Sn-Beta and Sn-Beta.

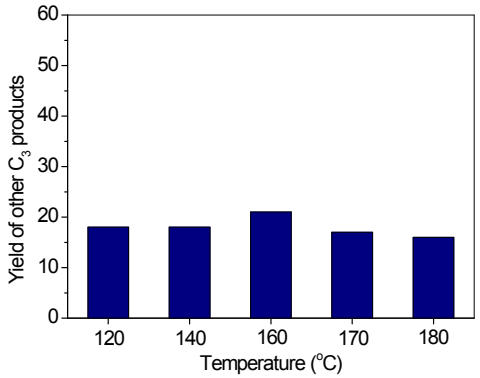


Fig. S7 Effect of reaction temperature on the formation of other C_3 products from glucose.

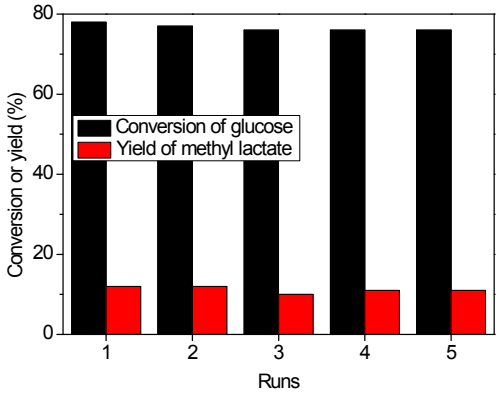


Fig. S8 The recyclability of 1Mg-Sn-Beta catalyst with the initial activity for MLA formation. Reaction conditions: glucose (0.37 g), 1Mg-Sn-Beta (0.20 g), methanol (15 mL), N_2 (0.4 MPa), 120 °C, 0.5 h.

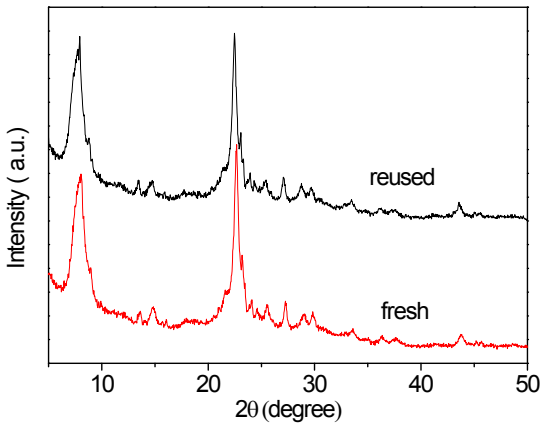


Fig. S9 XRD patterns of fresh and reused 1Mg-Sn-Beta.

Table S1 Results of N_2 physisorption of fresh and reused 1Mg-Sn-Beta

Catalyst	S_{BET} (m^2 g^{-1})	S_{ext}[a] (m^2 g^{-1})	V_{tot} (mL g^{-1})	V_{meso}[a] (mL g^{-1})[a]	V_{micro} (mL g^{-1})	Sn content (wt%)[b]	Mg content (wt%)[b]	Relative crystallinity (%)
Fresh	515	164	0.54	0.36	0.18	1.90	0.392	100
Reused	453	157	0.49	0.34	0.15	1.85	0.384	97

[a]External surface area = BET surface area - micropore surface area; mesopore volume = total pore volume - micropore volume, where the micropore surface area and volume were determined by the t-plot method at a relative pressure of 0.05-0.70.

[b]Determined by ICP.

Reference