

Electronic Supplementary Information (ESI)

Efficient and selective aqueous photocatalytic mono-dehydration of sugar alcohols using functionalized yttrium oxide nanocatalysts

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† Electronic supplementary information (ESI) available: XPS survey scan of synthetic samples; XPS measurement of Ti 2p and C 1s regions for synthetic samples; XRD comparison of C1 with that of standard Y₂O₃; low-angle XRD patterns of powdered samples; FT-IR spectra of synthetic samples; GC-MS examples for catalytic products.

1. XPS survey scans of synthetic samples

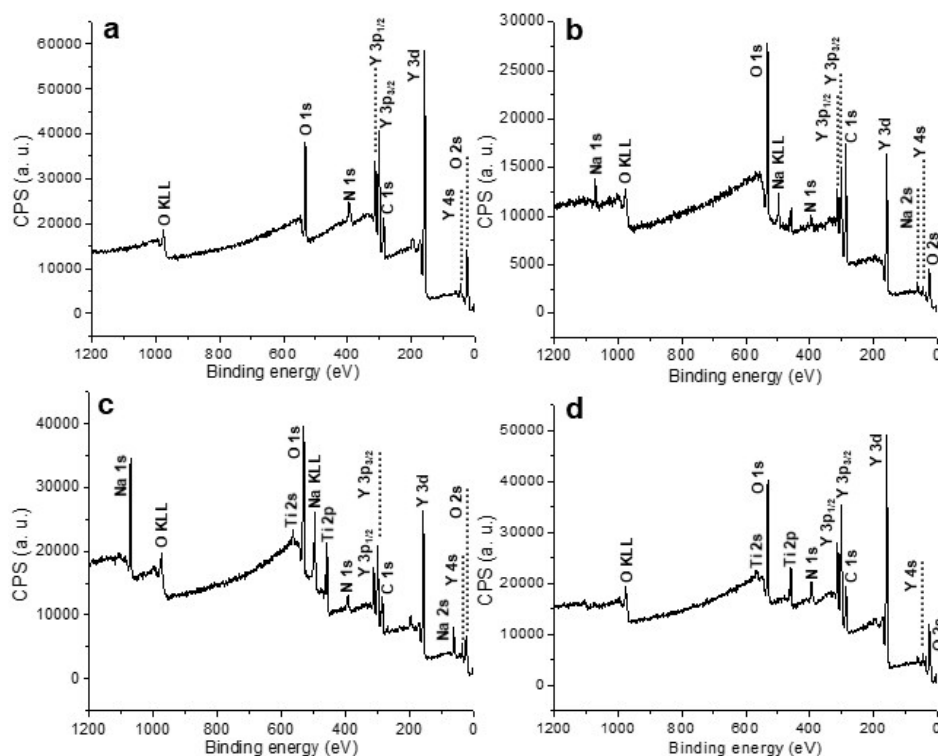


Fig. S1 XPS survey scans of (a) C1, (b) C2, (c) C3, and (d) C4.

2. XPS measurements of Ti 2p and C 1s regions for synthetic samples

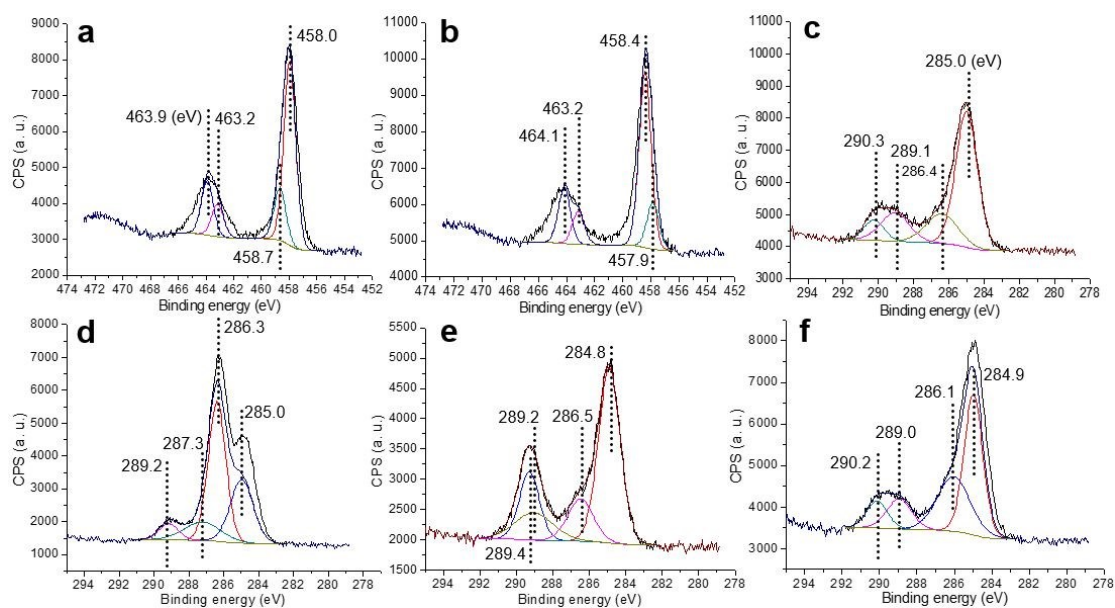


Fig. S2 XPS measurements of Ti 2p regions for (a) C3 and (b) C4 as well as that of C 1s regions for (c) C1, (d) C2, (e) C3, and (f) C4.

3. XRD comparison of C1 with that of standard Y_2O_3 sample

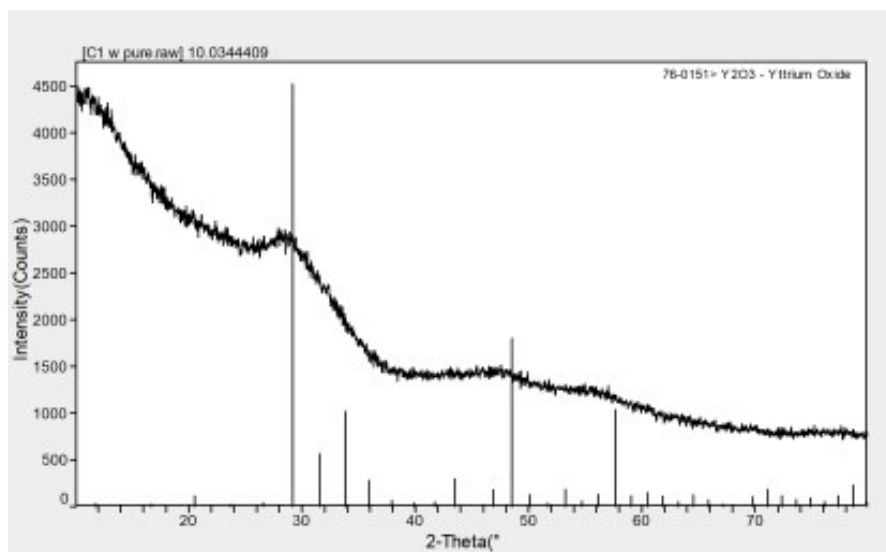


Fig. S3 Wide-angle XRD comparison of C1 with that of standard Y_2O_3 sample.

4. Standard XRD of TiO_2 (anatase)

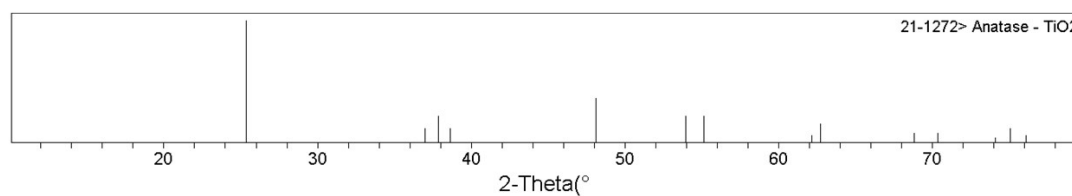


Fig. S4 Standard XRD of TiO_2 (anatase).

5. Low-angle XRD patterns of powdered samples

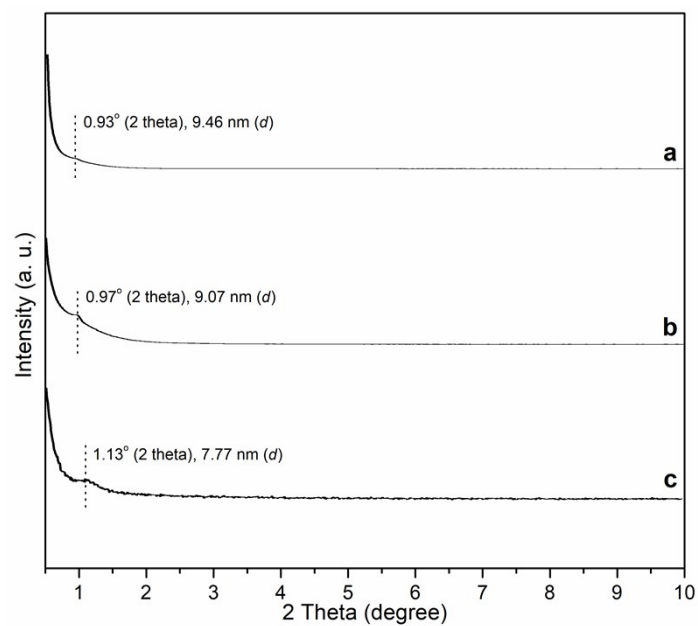


Fig. S5 Low-angle XRD patterns of powdered (a) C1, (b) C2, and (c) C4.

6. FT-IR spectra of synthetic samples

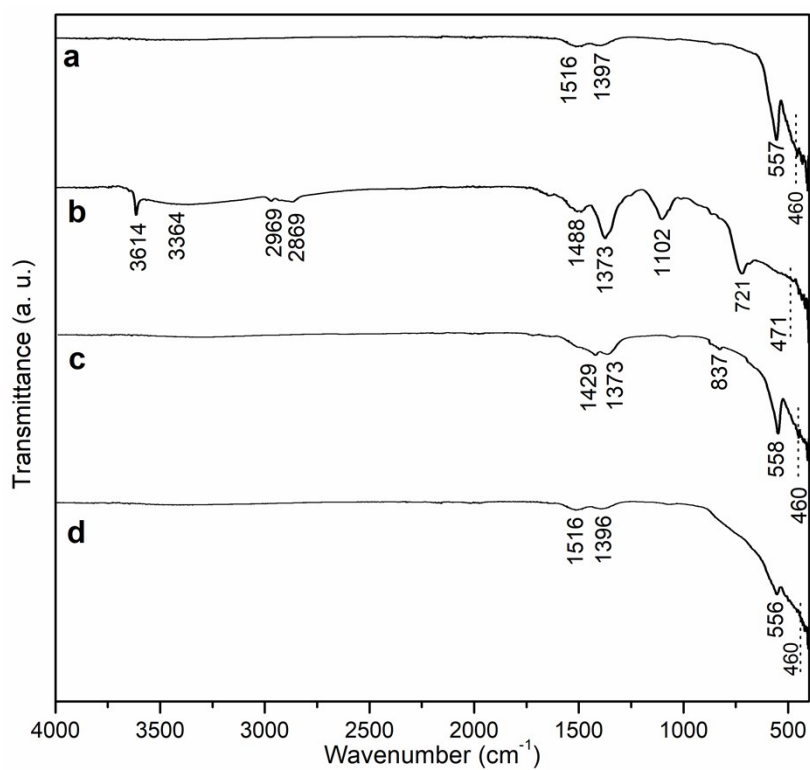


Fig. S6 FT-IR spectra of (a) C1, (b) C2, (c) C3, and (d) C4.

7. DSC curves of synthetic samples

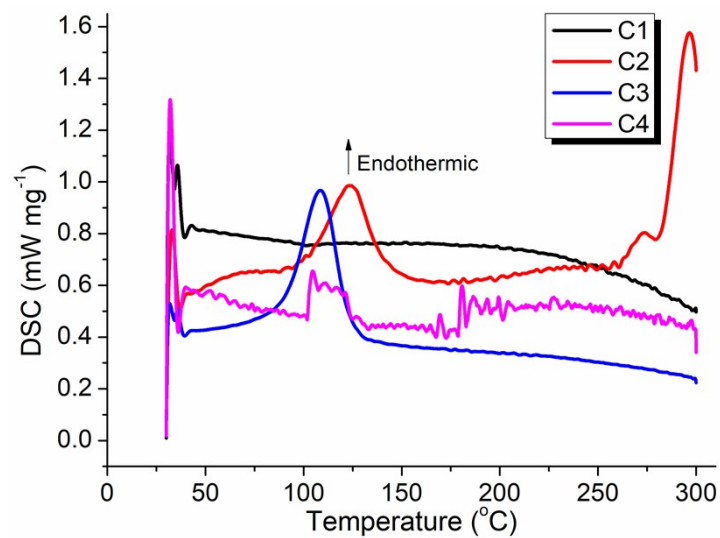


Fig. S7 DSC curves of synthetic samples.

8. GC-MS examples for catalytic dehydration of D-sorbitol (for Table 3)

1) Entry 3, Table 3

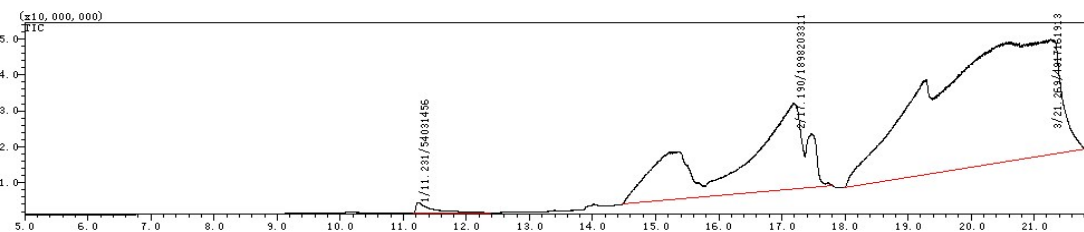
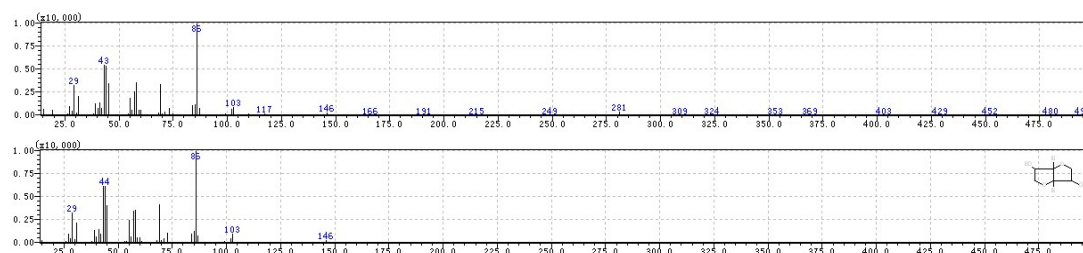


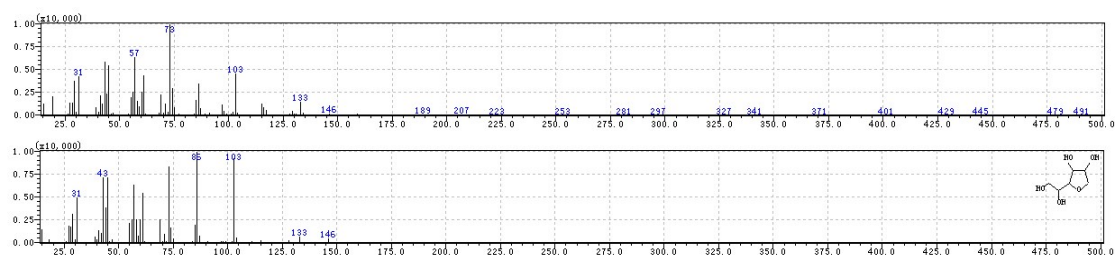
Fig. S8 GC part of GC-MS for entry 3, Table 3.

The peak for $t_R = 11.231$ min:



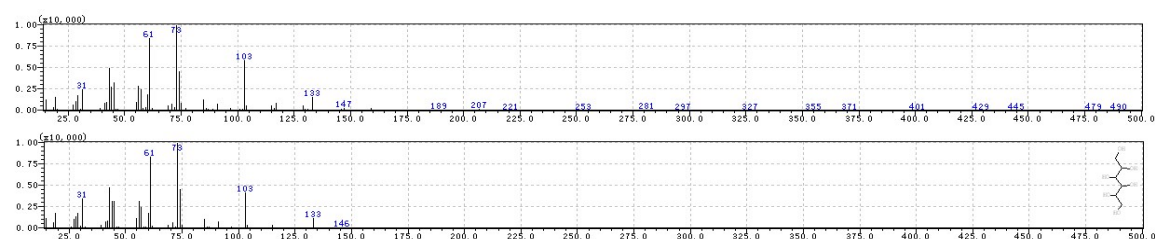
GC-MS: calcd. for $C_6H_{10}O_4$ 146, found 146 ($C_6H_{10}O_4$). Isosorbide.

The peak for $t_R = 17.190$ min:



GC-MS: calcd. for $C_6H_{12}O_5$ 164, found 146 ($C_6H_{12}O_5 - H_2O$). 1,4-Sorbitan.

The peak for $t_R = 21.269$ min:



GC-MS: calcd. for $C_6H_{14}O_6$ 182, found 147 ($C_6H_{14}O_6 - H_2O - OH$). The unreacted D-sorbitol.

2) Entry 4, Table 3

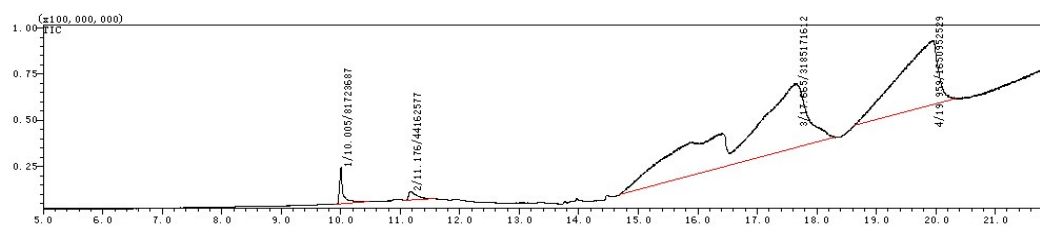


Fig. S9 GC part of GC-MS for Entry 4, Table 3.

The peaks at 10.005 and 11.237 min are both isosorbide, that at 17.665 min is 1,4-sorbitan. 19.959 min is unreacted D-sorbitol.

3) Entry 5, Table 3

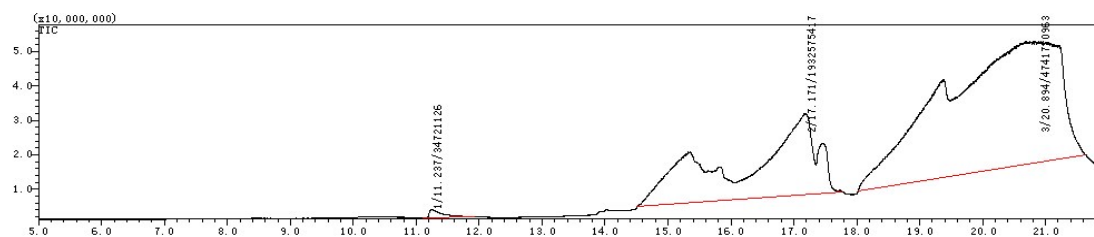


Fig. S10 GC part of GC-MS for entry 5, Table 3.

The peak at 11.237 min is isosorbide, that at 17.171 min is 1,4-sorbitan. 20.894 min is unreacted D-sorbitol.

4) Entry 7, Table 3

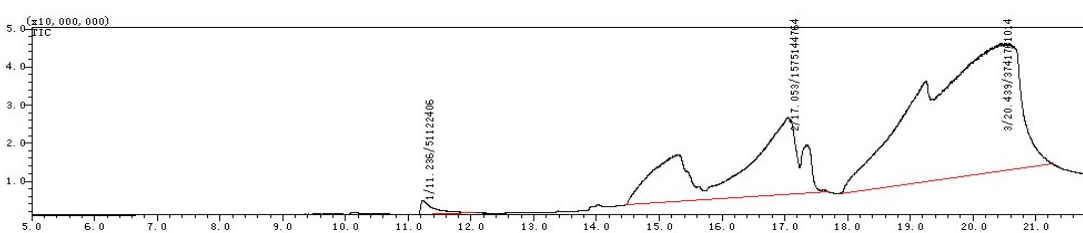


Fig. S11 GC part of GC-MS for entry 7, Table 3.

The peak at 11.236 min is isosorbide, that at 17.053 min is 1,4-sorbitan. 20.439 min is unreacted D-sorbitol.

9. GC-MS examples for catalytic dehydration of D-mannitol (for Table 4)

1) Entry 3, Table 4

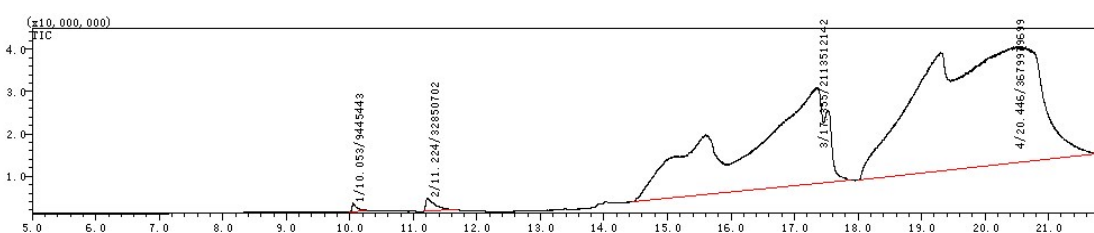
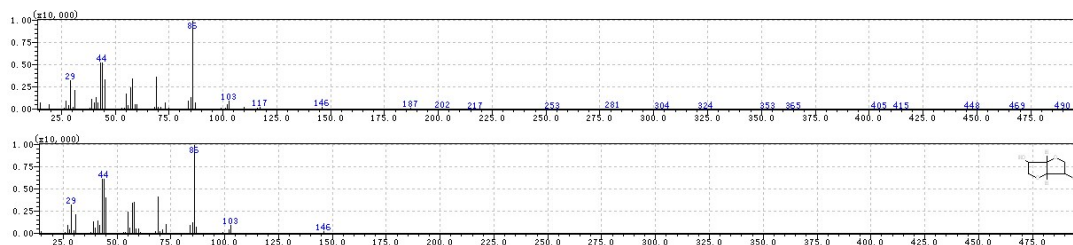


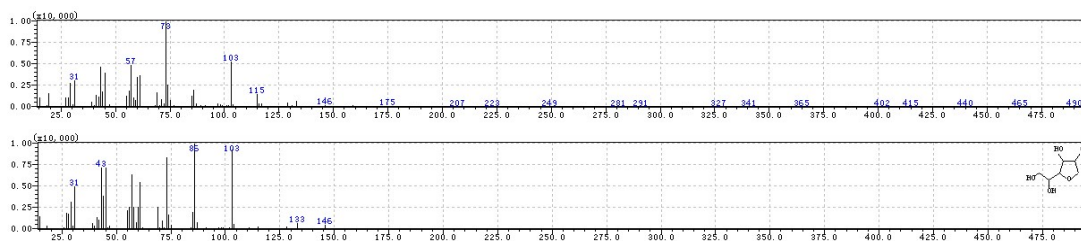
Fig. S12 GC part of GC-MS for entry 4, Table 4.

Peaks at 10.053 and 11.224 min are both isomannide:



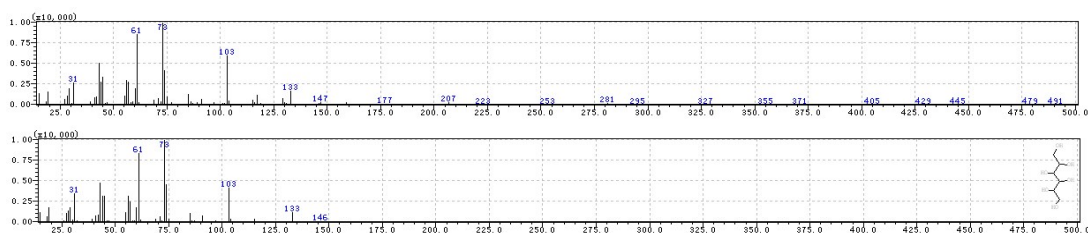
GC-MS: calcd. for $C_6H_{10}O_4$ 146, found 146 ($C_6H_{10}O_4$).

That at 17.355 min is 1,4-mannitan:



GC-MS: calcd. for $C_6H_{12}O_5$ 164, found 146 ($C_6H_{12}O_5 - H_2O$).

That at 20.446 min is unreacted D-mannitol:



GC-MS: calcd. for $C_6H_{14}O_6$ 182, found 147 ($C_6H_{14}O_6 - H_2O - OH$).

2) Entry 4, Table 4

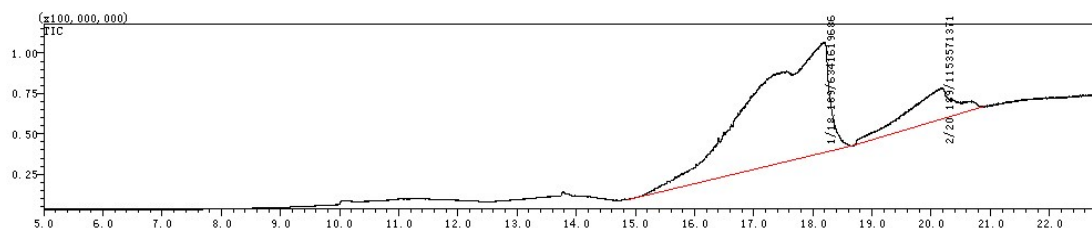


Fig. S13 GC part of GC-MS for entry 4, Table 4.

The peak at 18.169 min is 1,4-mannitan, That at 20.189 min is unreacted D-mannitol.

3) Entry 5, Table 4

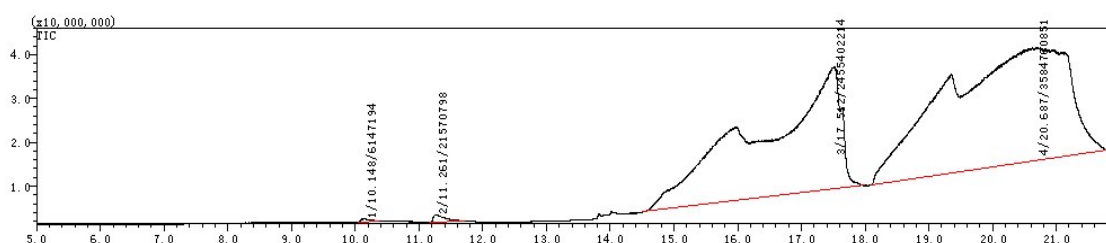


Fig. S14 GC part of GC-MS for entry 5, Table 4.

The peak at 10.148 and 11.261 min are both isomannide ($\ll 1.0\%$, as 0%), that at 17.512 min is 1,4-mannitan, while that at 20.687 min is unreacted D-mannitol.

4) Entry 7, Table 4

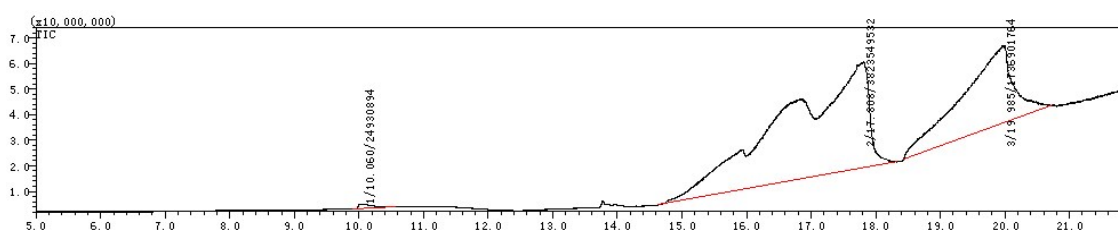


Fig. S15 GC part of GC-MS for entry 7, Table 4.

The peak at 10.060 min is isomannide ($\ll 1.0\%$, as 0%), that at 17.808 min is 1,4-mannitan, while that at 19.985 min is unreacted D-mannitol.