Supporting Information of

Conversion of Biomass-derived Sugars to 1,1,2-Trialkoxyethane via [2+4] Retro-aldol Reaction over Alkaline and Alkaline Earth Metal Salt of Phosphotungstic Acid

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Tables

Table S1 Comparison of the specific surface area of cesium phosphotungstates with literature results

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Catalyst	Specific surface area, m^2/g	Ref
HPW	8	1
HPW	3.9	2
Cs_2HPW	3.3	2
Cs_2HPW	26	3
$Cs_{2.5}H_{0.5}PW$	13.4	2
$Cs_{2.5}H_{0.5}PW$	110	4
$Cs_{2.5}H_{0.5}PW$	83	3
$Cs_{2.5}H_{0.5}PW$	128	5
Cs_3PW	127	2
Cs_2HPW	74.24	This work

1. H. Yuan and Q. Shu, *Applied Mechanics and Materials*, 2013, **291**, 300-306.
2. M. J. da Silva, N. P. G. Lopes, S. O. Ferreira, R. C. Da Silva, R. Natalino, D. M. Chaves and M. G. Texeira, *Chemical Papers*, 2020, **75**, 153-168.
3. M. J. da Silva, A. A. Rodrigues and N. P. G. Lopes, *Chemistry*, 2023, **5**, 662-690.
4. S. Sandesh, P. Manjunathan, A. B. Halgeri and G. V. Shanbhag, *RSC Advances*, 2015, **5**, 104354-104362.
5. M. Kimura, T. Nakato and T. Okuhara, *Applied Catalysis A: General*, 1997, **165**, 227-240.

Figures

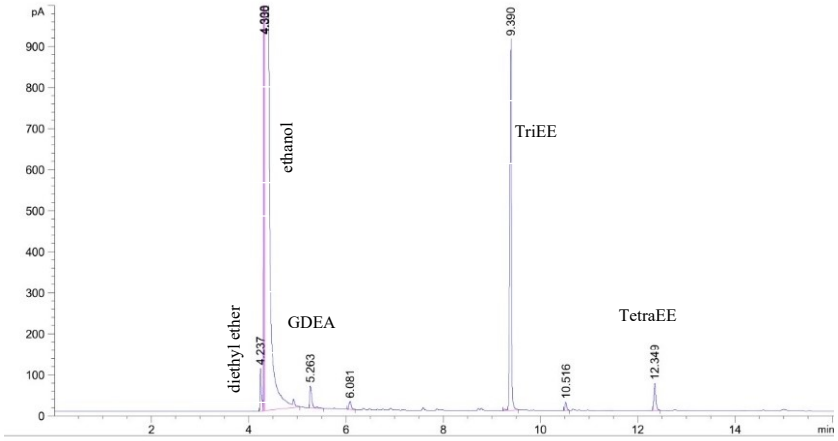


Fig. S1 A typical gas chromatogram of the reaction product

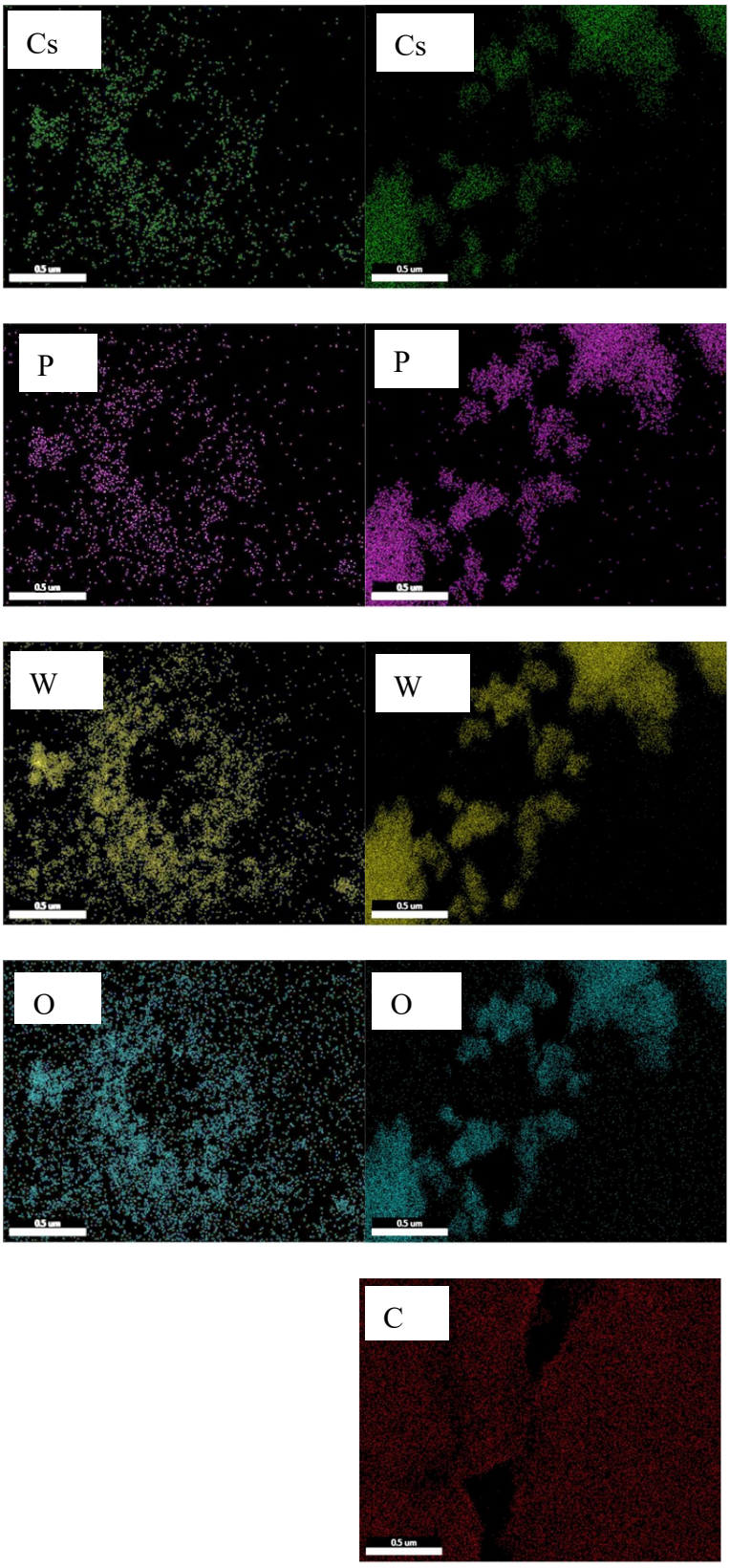


Fig. S2 EDS mapping of the fresh Cs_2HPW catalyst (left) and the spent Cs_2HPW catalyst (right)

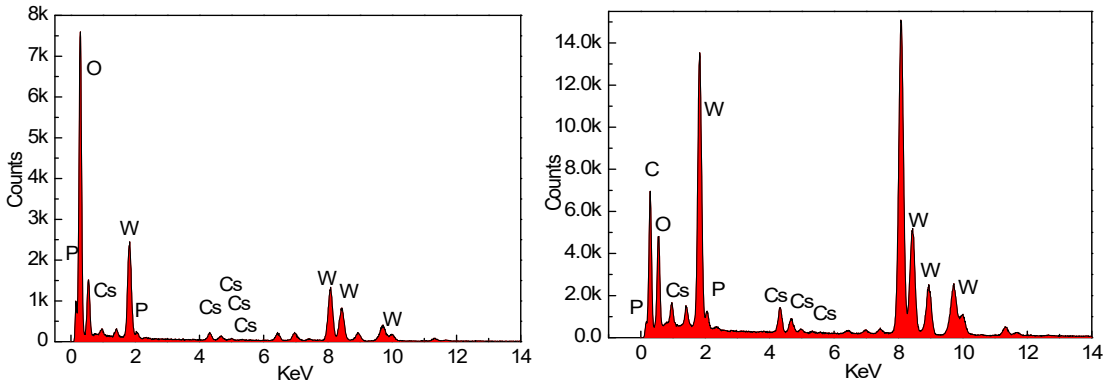


Fig. S3 EDS spectra of the fresh Cs_2HPW catalyst (left) and the spent catalyst Cs_2HPW (right)

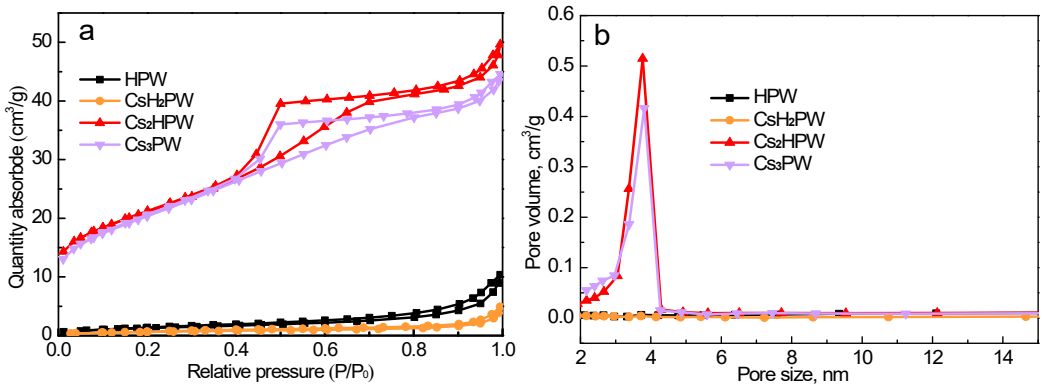
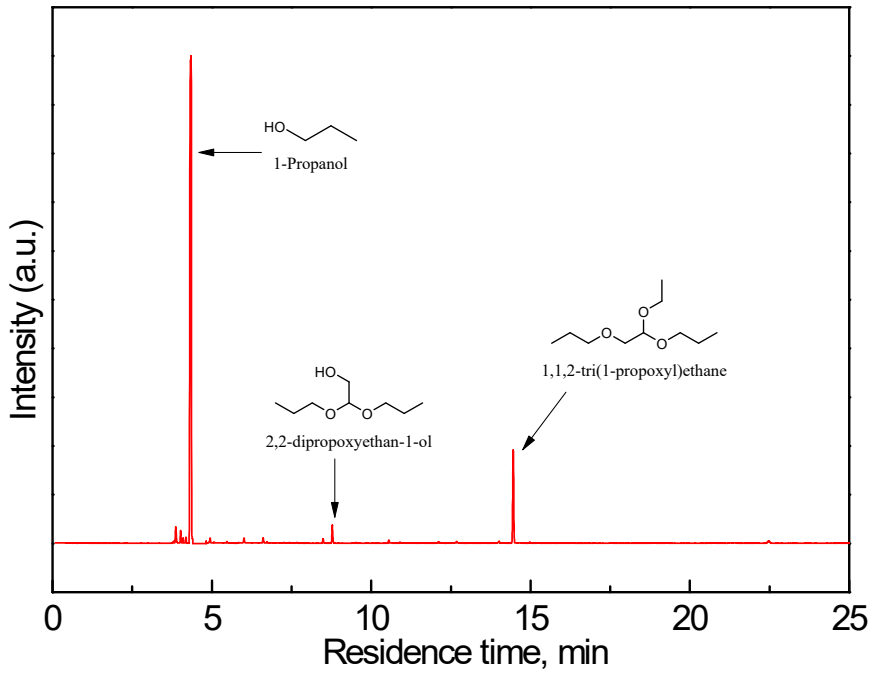
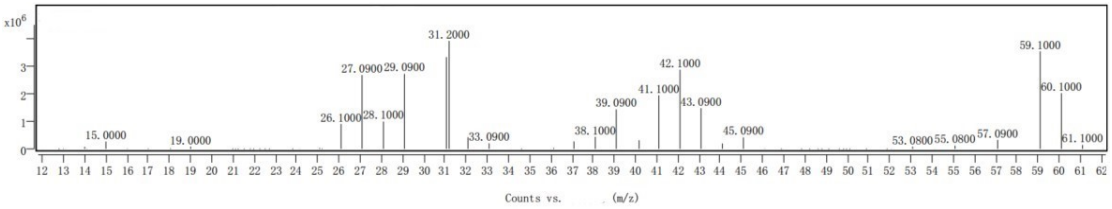


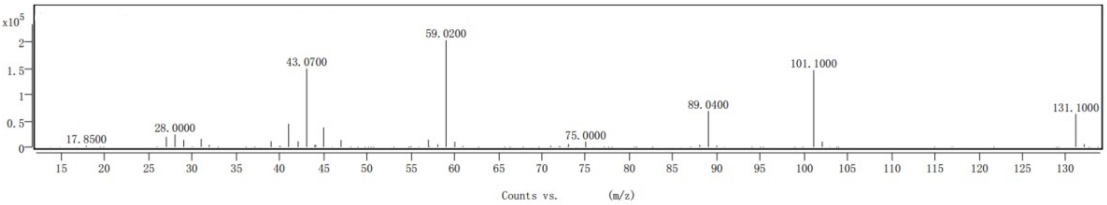
Fig. S4 N_2 adsorption-desorption isotherms and pore size distribution of HPW and $Cs_xH_{3-x}PW$



1-Propanol



2,2-dipropoxyethan-1-ol



1,1,2-tri(1-propoxyl)ethane

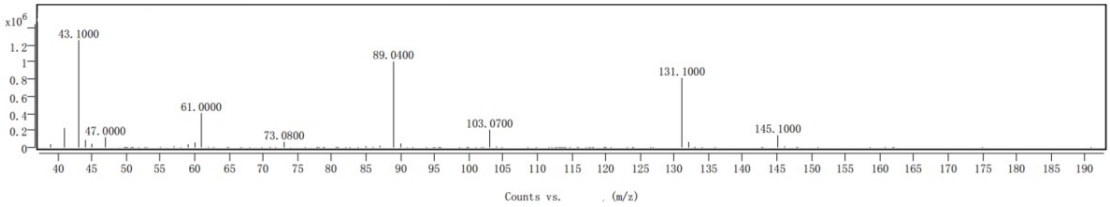
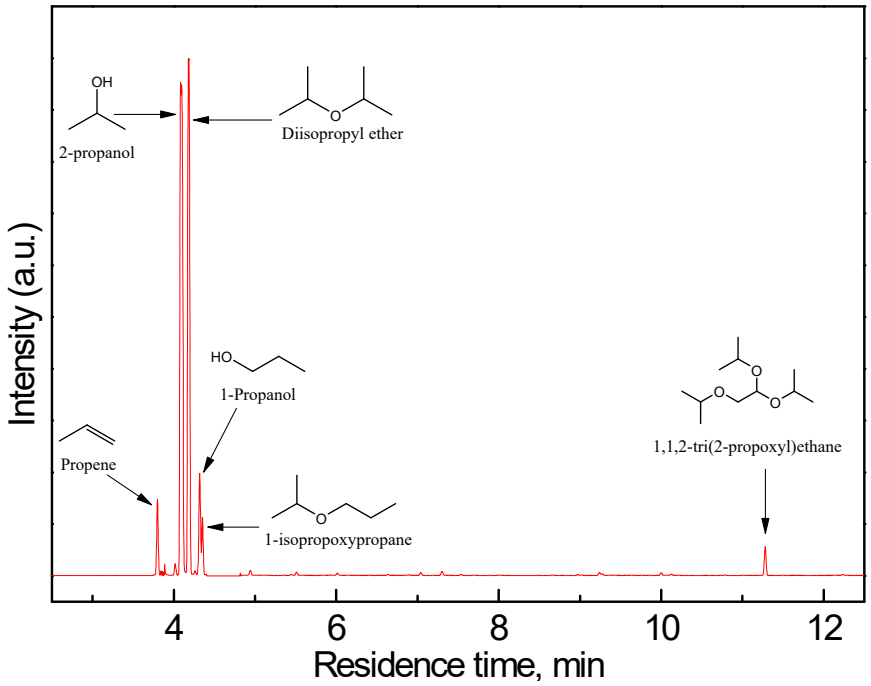
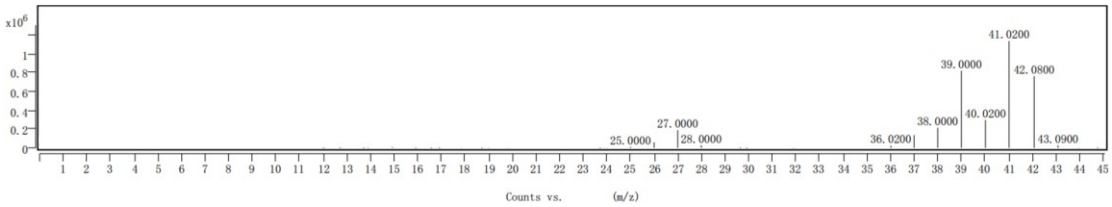


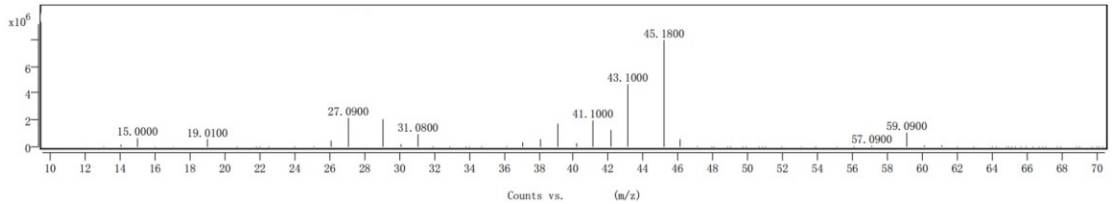
Fig. S5 GC-MS spectra of the reaction product of glucose conversion in 1-propanol



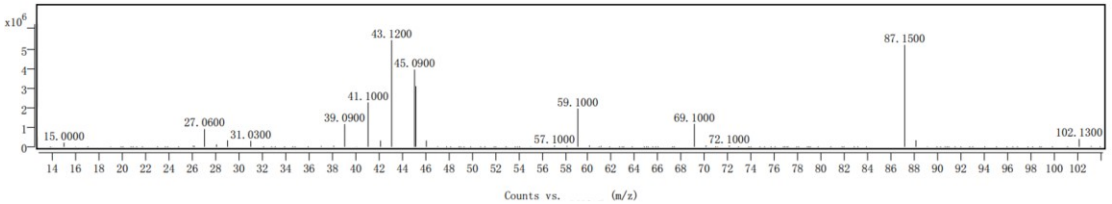
Propene



2-propanol

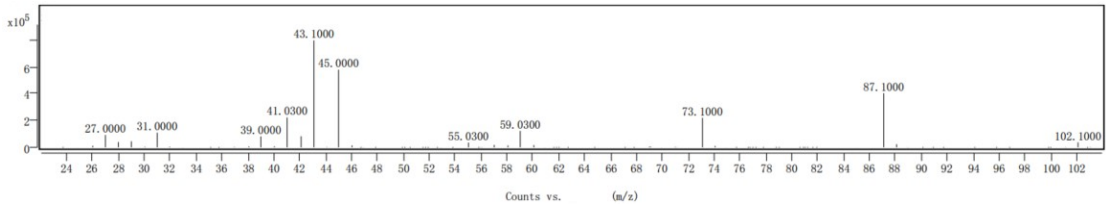


Diisopropyl ether



1-Propanol

1-isopropoxypropane



1,1,2-tri(2-propoxyl)ethane

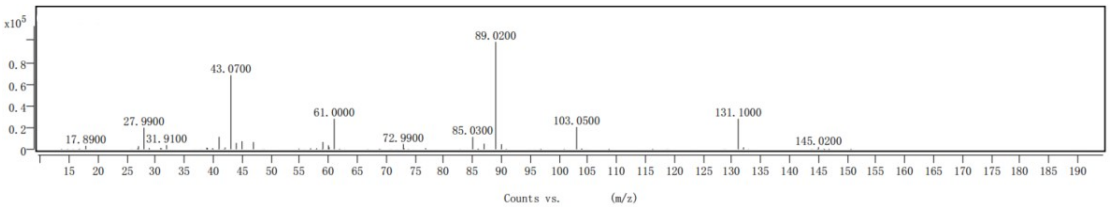
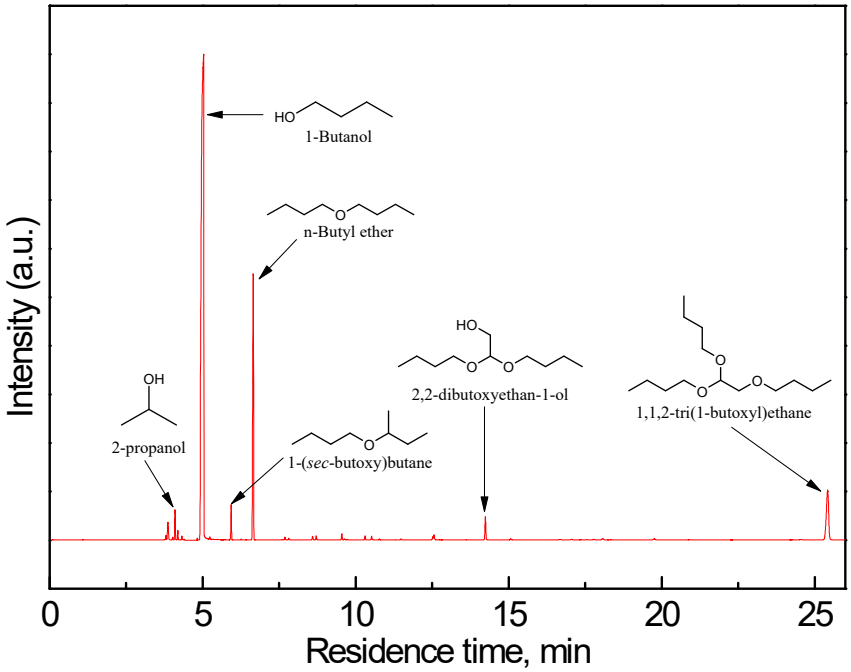
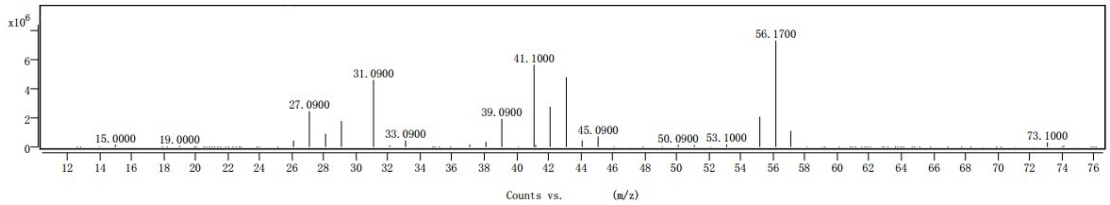


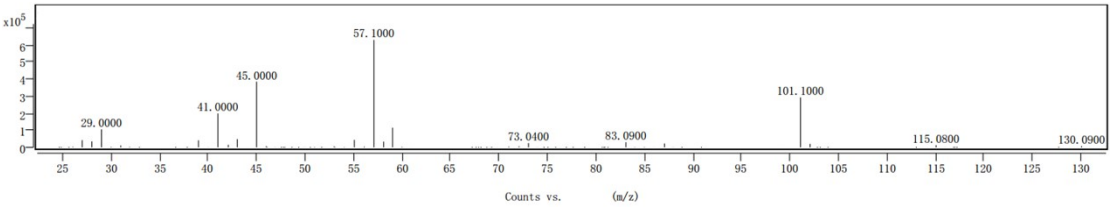
Fig. S6 GC-MS spectra of the reaction product of glucose conversion in 2-propanol



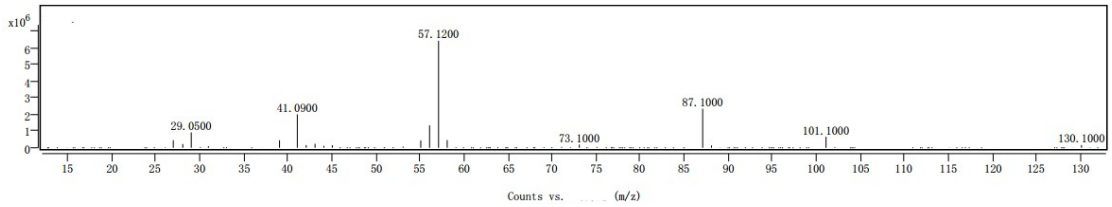
1-Butanol



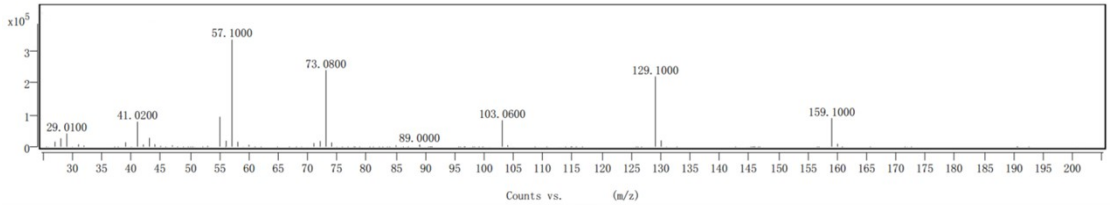
1-(*sec*-butoxy)butane



n-Butyl ether



2,2-dibutoxyethan-1-ol



1,1,2-tri(1-butoxyl)ethane

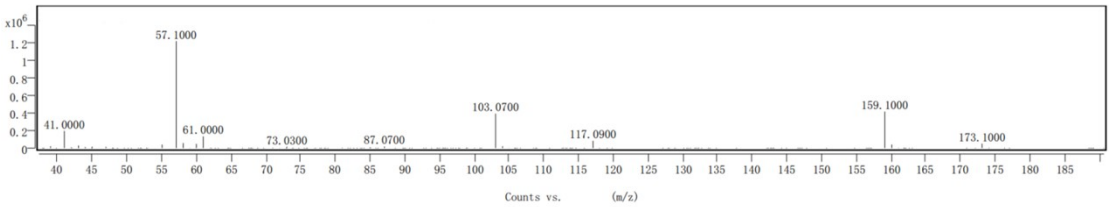


Fig. S7 GC-MS spectra of the reaction product of glucose conversion in 1-butanol

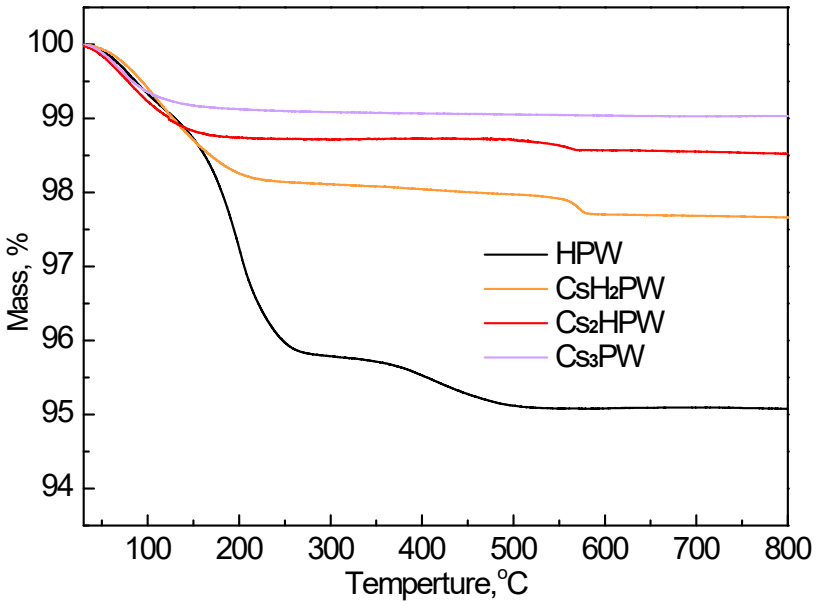


Fig. S8 TG curves of the $Cs_xH_{3-x}PW$ samples

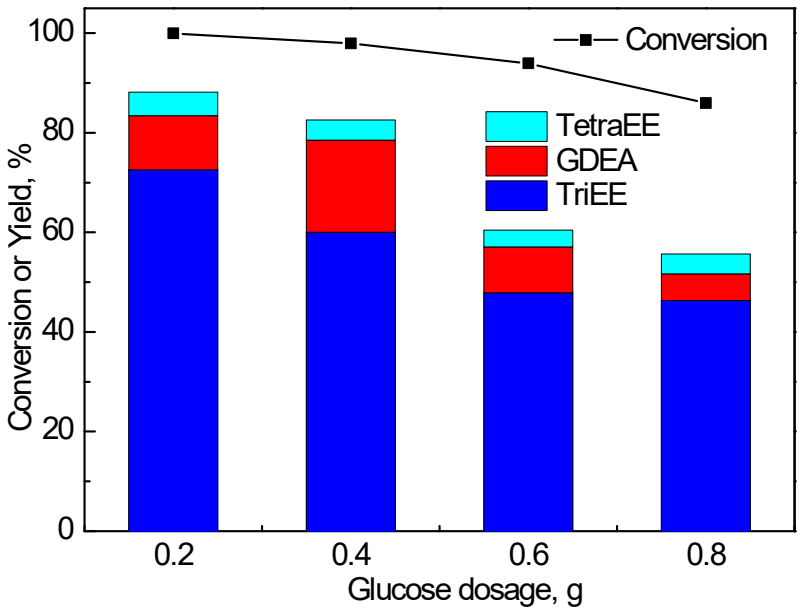


Fig. S9 Effect of glucose concentration

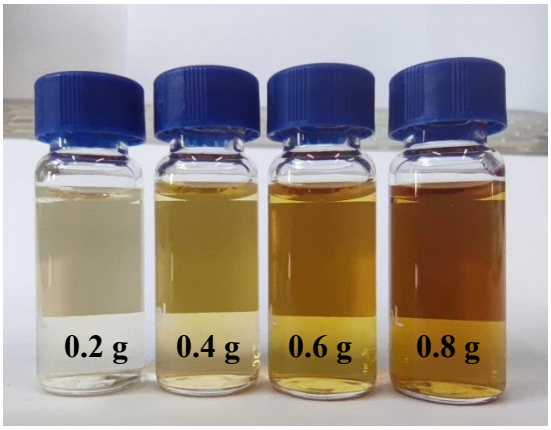


Fig. S10 Color change of reaction mixture with different glucose concentration