Electronic supplementary information

One-pot conversion of biomass-derived xylose to furfuralcohol by a chemo-enzymatic sequential acid-catalyzed dehydration and bioreduction

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Table S1. Yields of furfural in the presence of SO_4^{2-}/SnO_2-APG or/and oxalic acid at 170 ^oC for 20 min.

Fig. S1. SEM images of fresh APG (a) and solid acid SO_4^{2-}/SnO_2-APG (b).

Fig. S2. FT-IR images of fresh APG and solid acid SO_4^{2-}/SnO_2-APG.

Fig. S3. XRD images of fresh APG and solid acid SO_4^{2-}/SnO_2-APG.

Fig. S4. Raman images of fresh APG and solid acid SO_4^{2-}/SnO_2-APG.

Fig. S5. MS for furfural (left) and FOL (right).

Fig. S6. ^1H NMR for the prepared FOL.

Fig. S7 Recyclability and stability of SO_4^{2-}/SnO_2-APG solid catalyst for the conversion of corncob hydrolysate to furfural. Reaction conditions for the

recycling of the solid acid catalyst for the first step reaction: corncob pretreatment hydrolysate with a xylose concentration of 18.1 g/L, 3.6% SO_4^{2-}/SnO_2-APG solid catalyst in a 30 mL reaction system with magnetic stirrer (500 rpm) at 170 °C for 20 min.

Fig. S8 Recycling of immobilized *E. coli* CCZU-A13 cells for the conversion of furfural to FOL. Reaction conditions for the recycling of the biocatalyst for the the second step: 10.0 g immobilized cells (corresponds to 0.51 g dry cell weight), glucose (1 mol glucose/mol furfural) and 18.1 g/L furfural in a 30 mL reaction system with magnetic stirrer (300 rpm) at 30 °C for 3 h.

Table S1. Yields of furfural in the presence of SO_4^{2-}/SnO_2-APG or/and oxalic acid at 170 °C for 20 min.

Entry	Substrate	Catalyst	Yield of furfural
1	Biomass-derived xylose	Residual oxalic acid (pH 1.9) [a]	15%
2	Biomass-derived xylose	Residual oxalic acid plus SO_4^{2-}/SnO_2-APG (pH 3.3) [b]	28%
3	Biomass-derived xylose	Oxalic acid plus SO_4^{2-}/SnO_2-APG (pH 1.9) [c]	44%
4	Commercial xylose	SO_4^{2-}/SnO_2-APG (pH 3.3) [d]	28%

[a] After the preparation of xylose-rich biomass hydrolysate (pH 1.9), residual oxalic acid in hydrolysate was used for the conversion of xylose into furfural.

[b] After the preparation of xylose-rich biomass hydrolysate (pH 1.9), the media was adjusted to pH 7.0, and SO_4^{2-}/SnO_2-APG (pH 3.3) was used for the conversion of xylose into furfural.

[c] After the preparation of xylose-rich biomass hydrolysate (pH 1.9), residual oxalic acid plus SO_4^{2-}/SnO_2-APG (pH 1.9) was used for the conversion of xylose into furfural.

[d] After the preparation of commercial xylose solution, SO_4^{2-}/SnO_2-APG (pH 3.3) was used for the conversion of xylose into furfural.

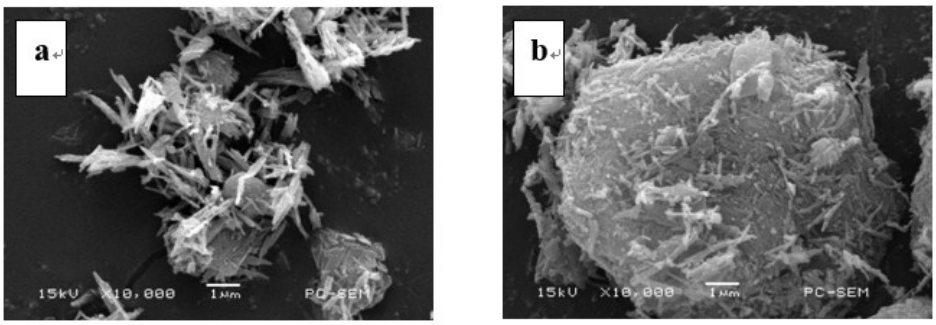


Fig. S1. SEM images of fresh APG (a) and solid acid SO_4^{2-}/SnO_2-APG (b).

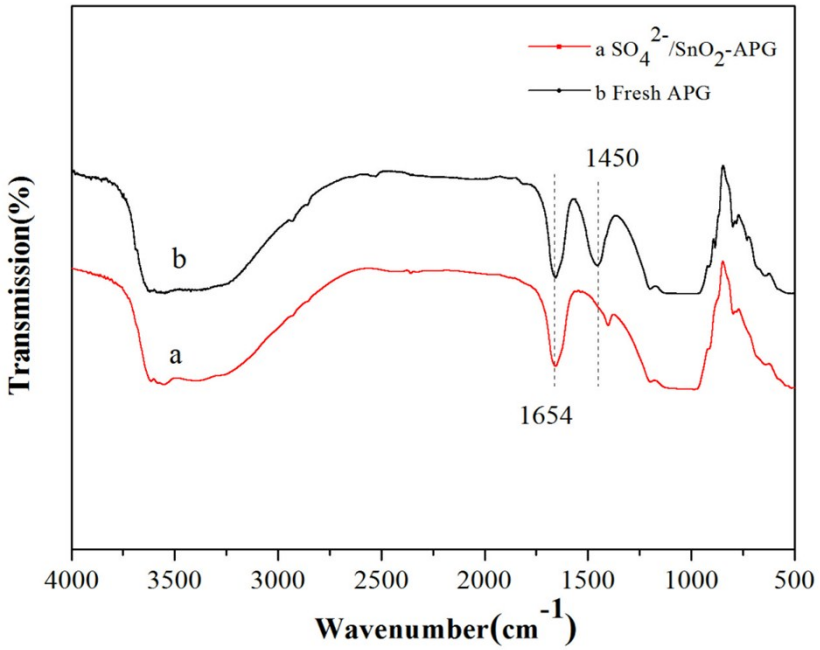


Fig. S2. FT-IR images of fresh APG and solid acid SO_4^{2-}/SnO_2-APG.

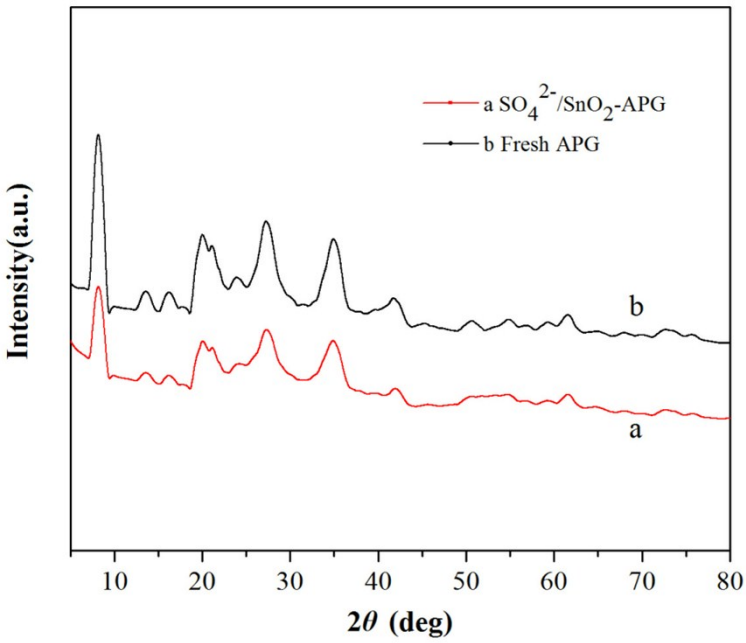


Fig. S3. XRD images of fresh APG and solid acid SO_4^{2-}/SnO_2-APG.

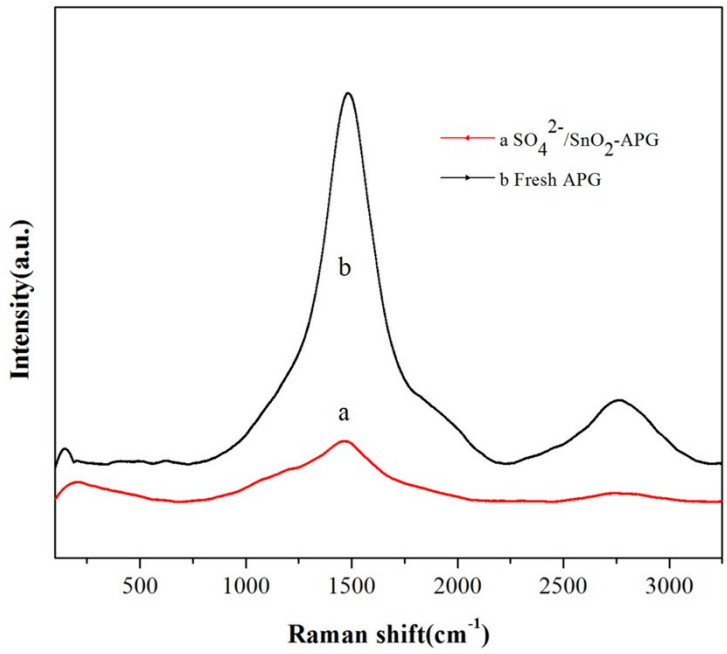


Fig. S4. Raman images of fresh APG and solid acid SO_4^{2-}/SnO_2-APG.

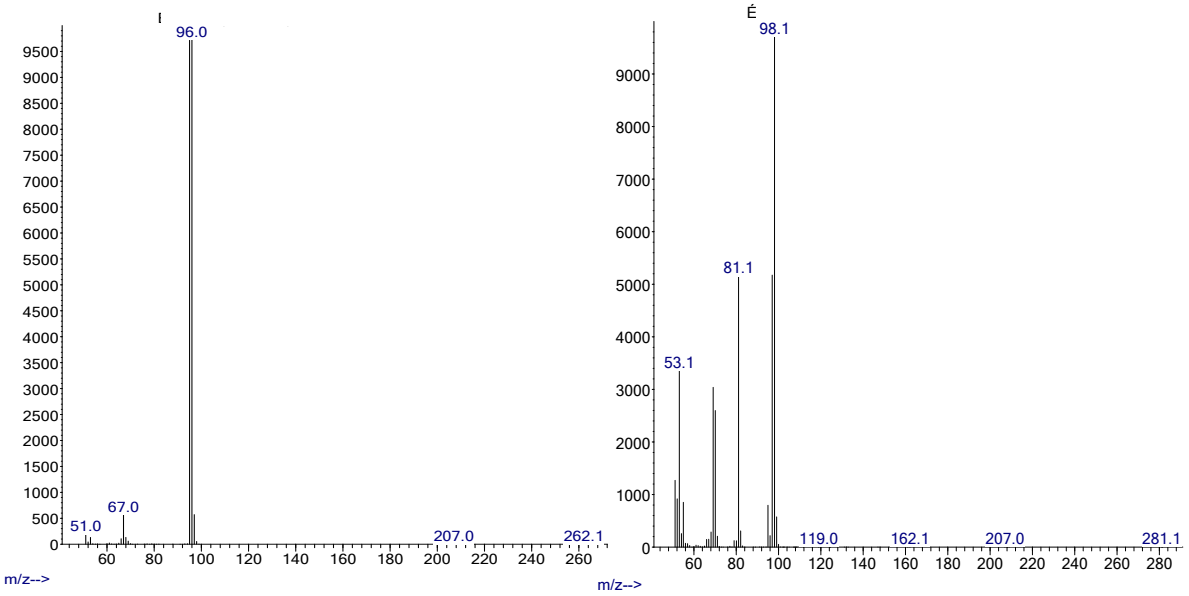


Fig. S5. MS for furfural (left) and FOL (right).

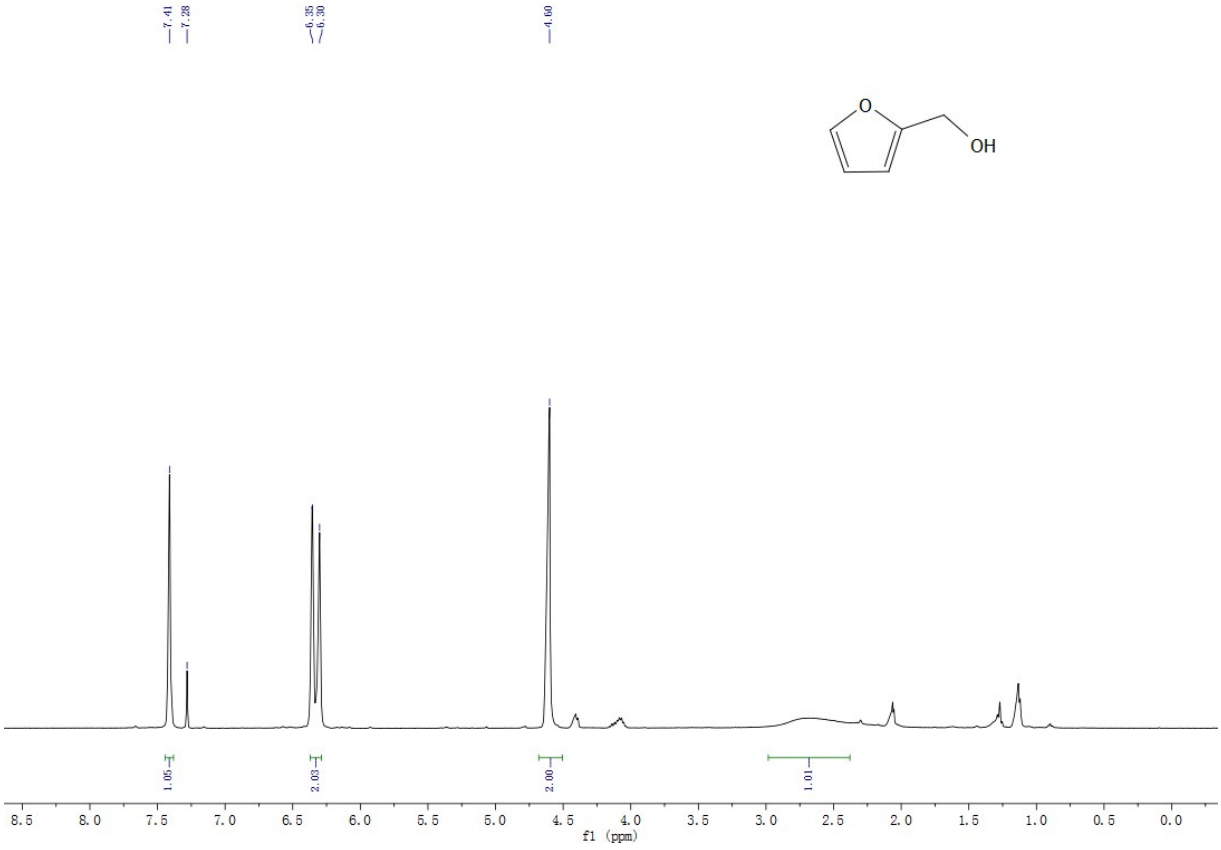
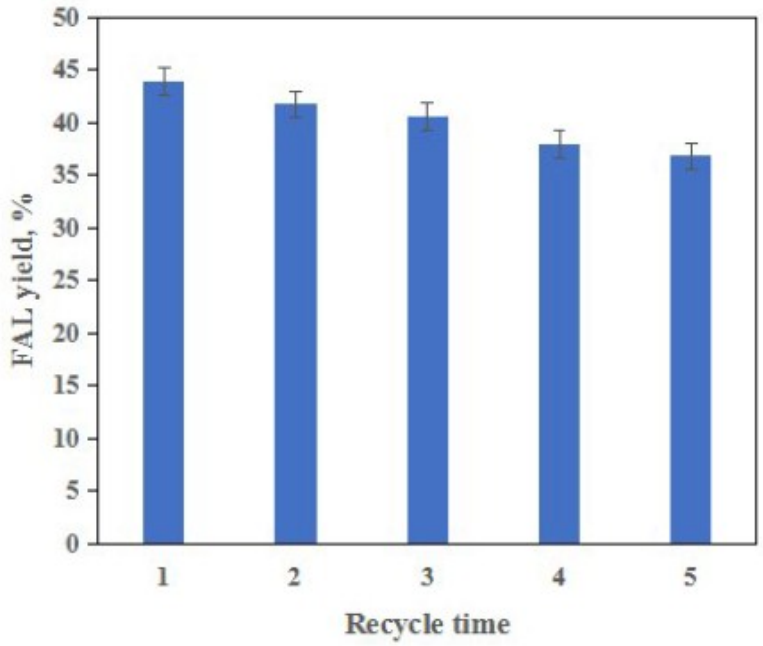


Fig. S6. ^{1}H NMR for the prepared FOL.



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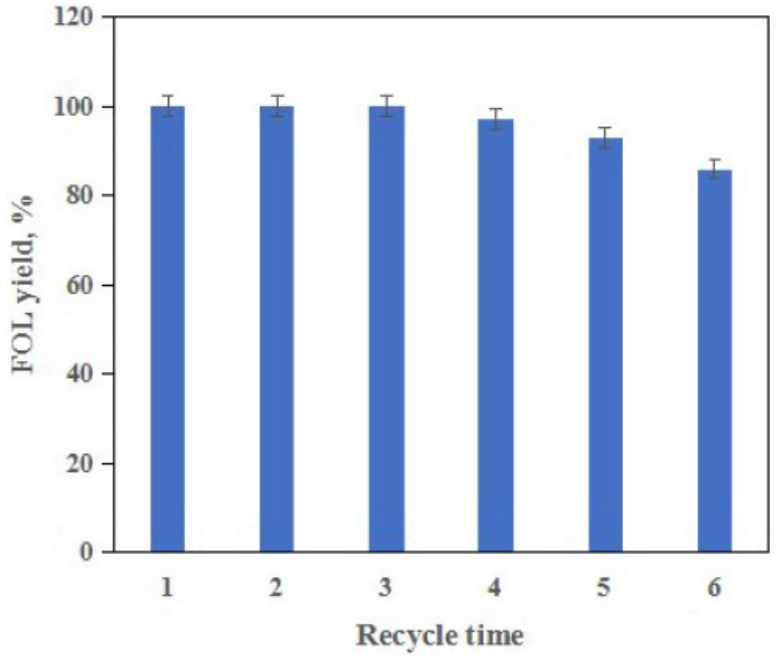

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