Supplementary Information:

Catalytic conversion of chitin biomass coupling the acetylation of glycerol without additives

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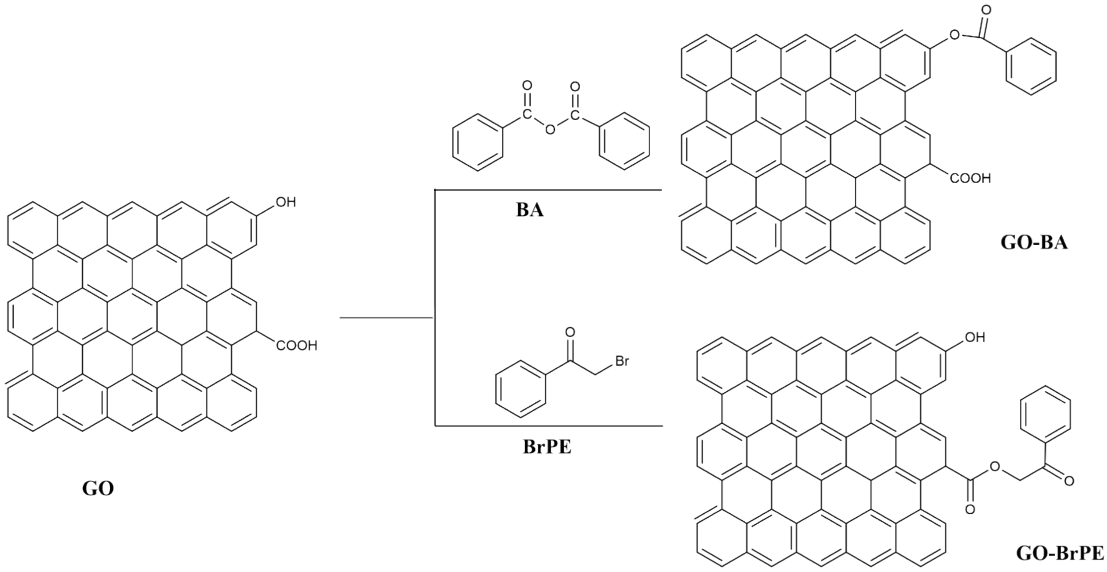

Figure S1. The reaction of BA and BrPE with oxygen groups on carbon materials.

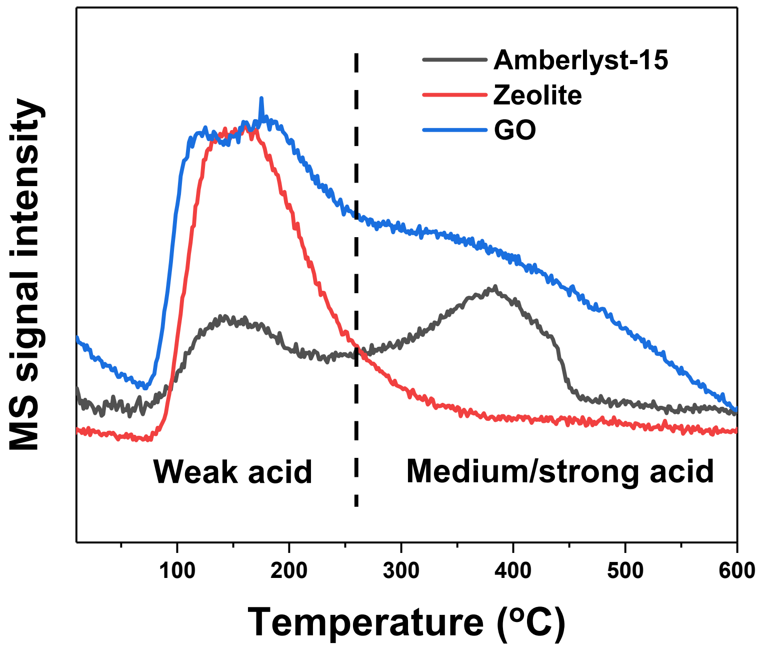

Figure S2. NH_3 signal intensity from the NH_3-TPD-MS results of the solid acid catalysts.

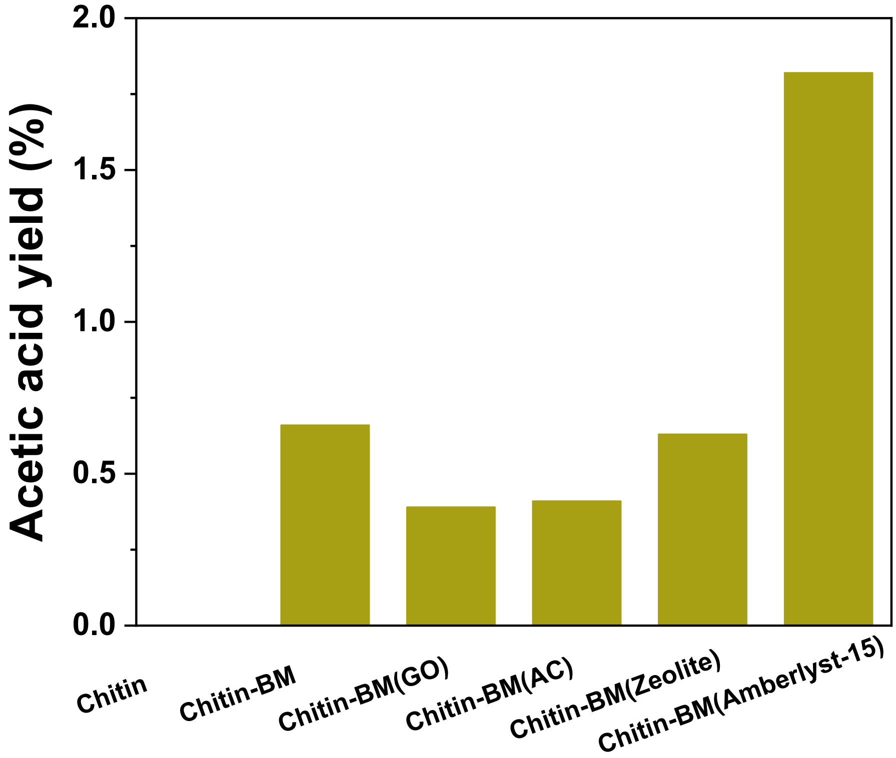

Figure S3. The acetic acid detected from the mechano-catalytic hydrolysis of chitin by ball milling with different solid catalysts.

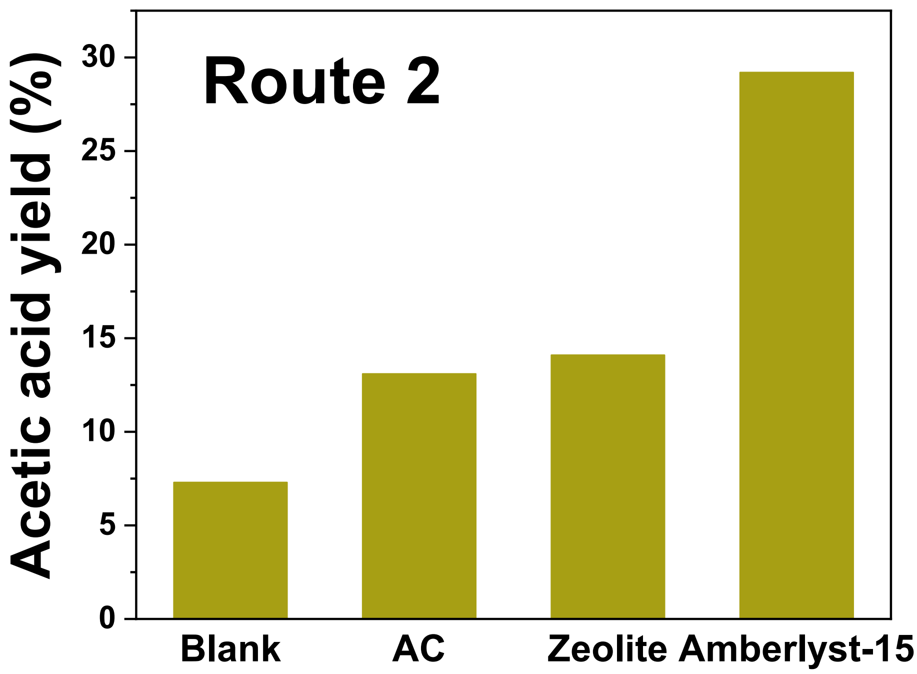

Figure S4. The acetic acid yield of different catalysts via Route 2. Conditions: 10 mL water, 0. 1 g Chitin, 0.1 g catalyst, 180 ºC, 2 h.

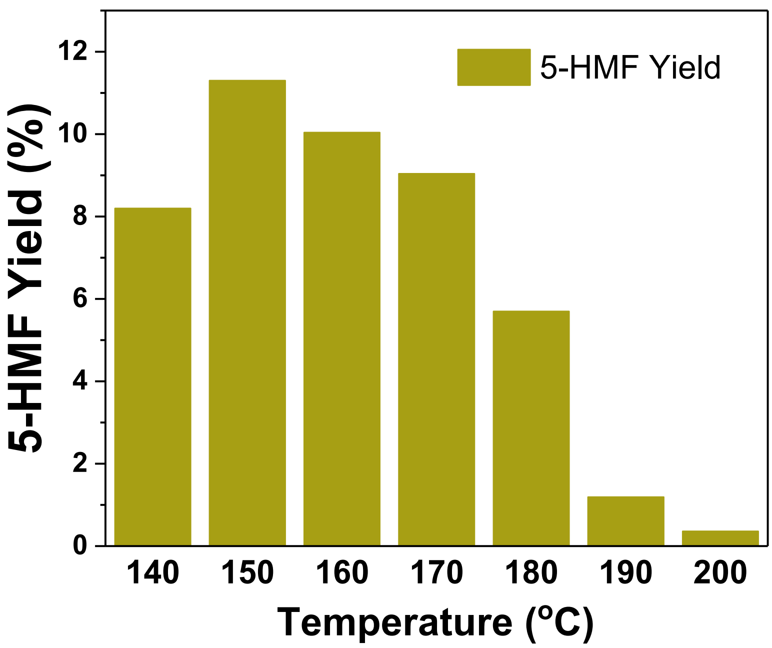

Figure S5. Impact of temperature on the 5-HMF yield over Chitin-BM(Amberlyst15) via Route 1. Conditions: 2 h, 10 mL solvent (80vol% THF), 0.21 g Chitin-BM(Amberlyst15).

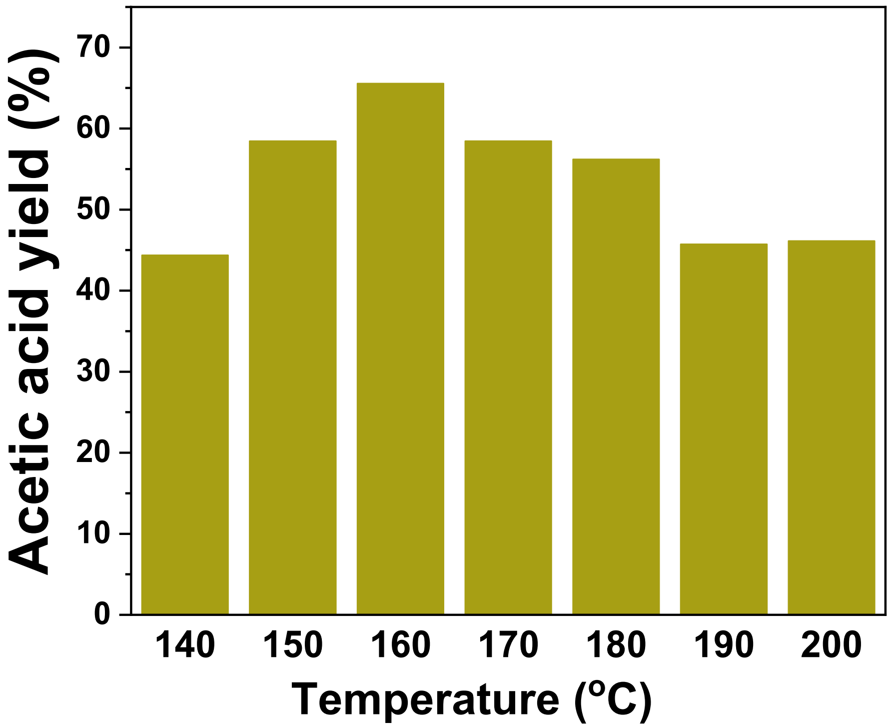

Figure S6. Impact of temperature on the acetic acid yield over Chitin-BM(Amberlyst15) via Route 1. Conditions: 2 h, 10 mL solvent (80vol% THF), 0.21 g Chitin-BM(Amberlyst15).

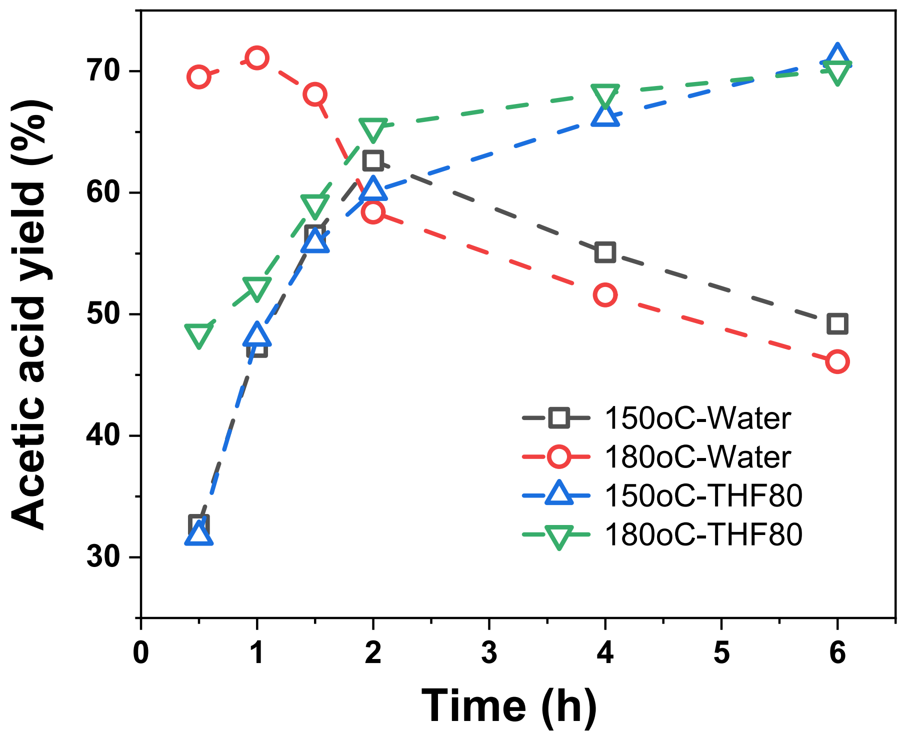

Figure S7. Evolution of acetic acid yield over time via Route 1 using the Amberlyst-15 catalyst under different solvent conditions at 150 and 180 ºC. Reaction conditions: 10 mL solvent (pure water and 80 vol% of THF, respectively), 0.21 g Chitin-BM(Amberlyst15), 4.6 mg glycerol.

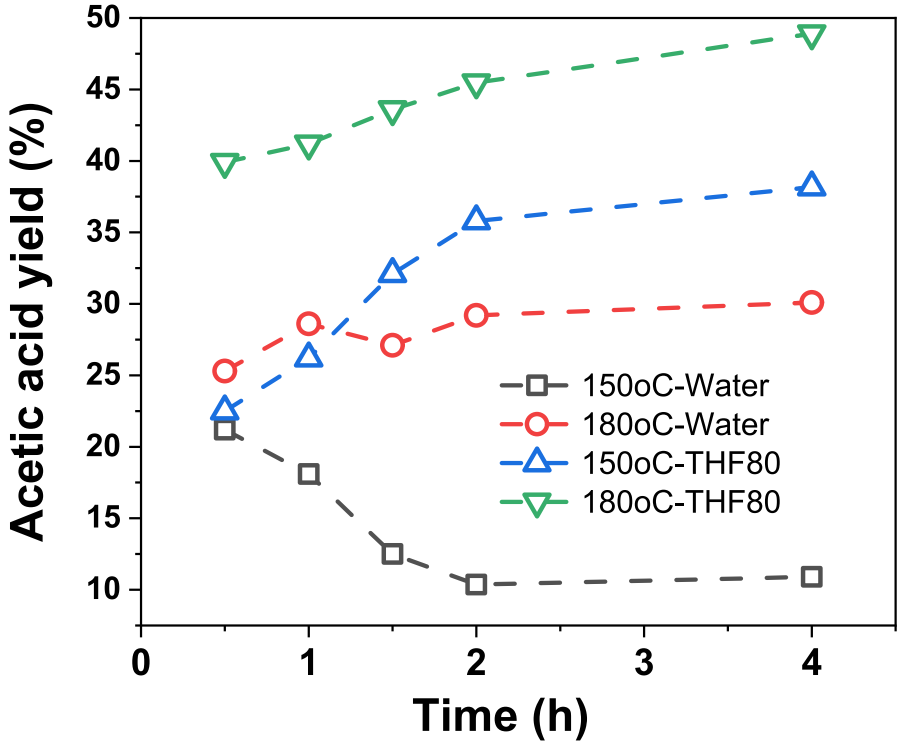

Figure S8. Evolution of acetic acid yield over time via Route 2 using the Amberlyst-15 catalyst under different solvent conditions at 150 and 180 ºC. Reaction conditions: 10 mL solvent (pure water and 80 vol% of THF, respectively), 0.1 g chitin + 0.1 g Amberlyst-15, 4.6 mg glycerol.

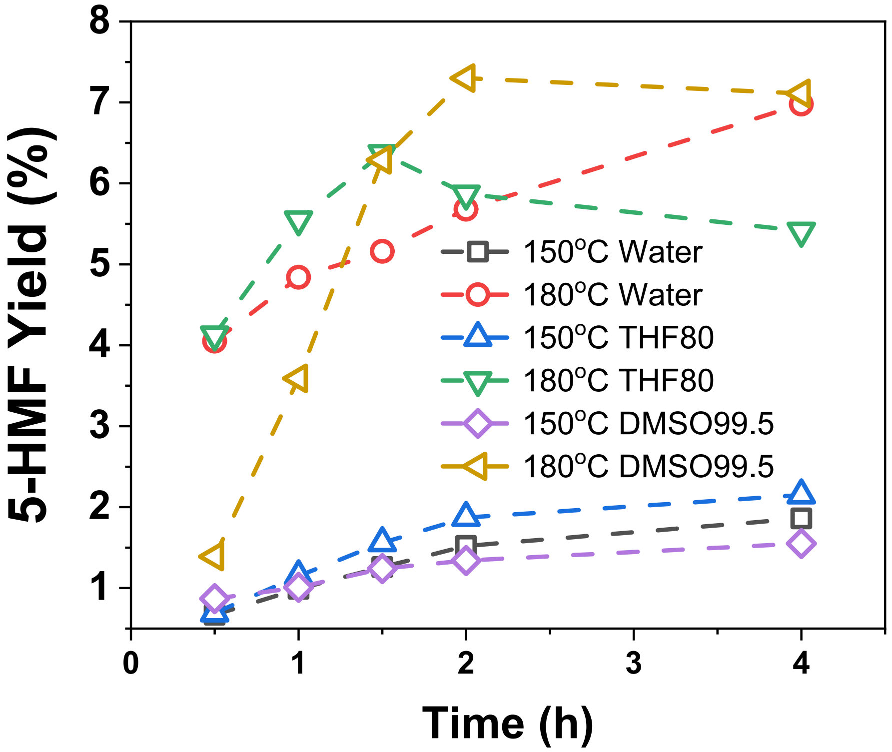

Figure S9. Evolution of 5-HMF yield over time via Route 1 using the Chitin-BM(Zeolite) under three different solvent conditions at 150 and 180 ºC. Reaction conditions: 10 mL solvent (pure water, 80 vol% of THF and 99.5 vol% DMSO), 0.21 g Chitin-BM(Zeolite), 4.6 mg glycerol.

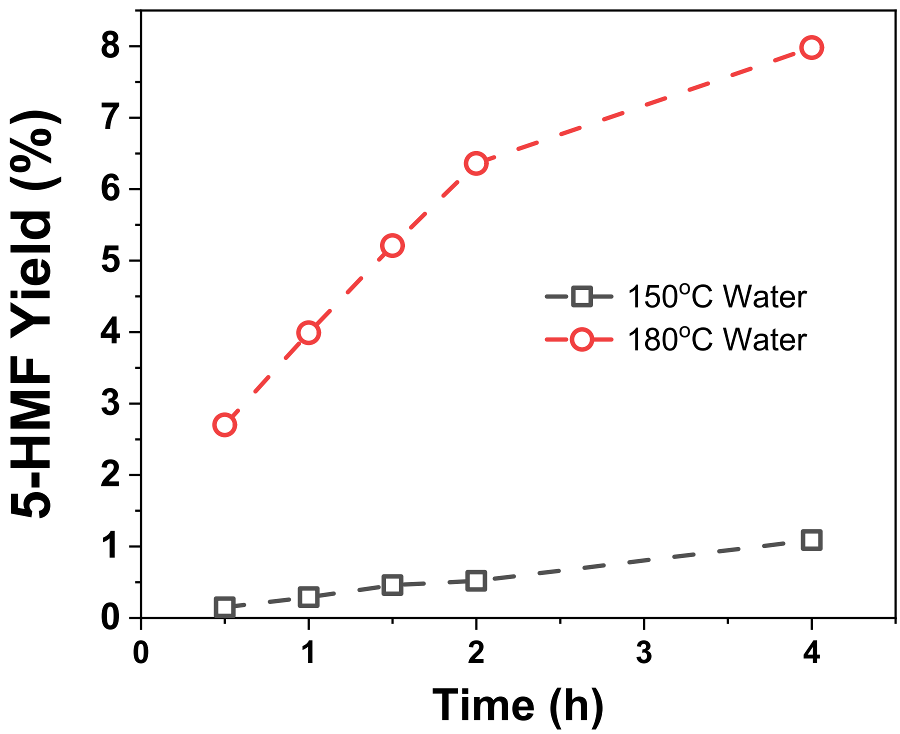

Figure S10. Evolution of 5-HMF yield over time via Route 1 using the Chitin-BM(AC) in water solvent conditions at 150 and 180 ºC. Reaction conditions: 10 mL pure water, 0.21 g Chitin-BM(AC), 4.6 mg glycerol.

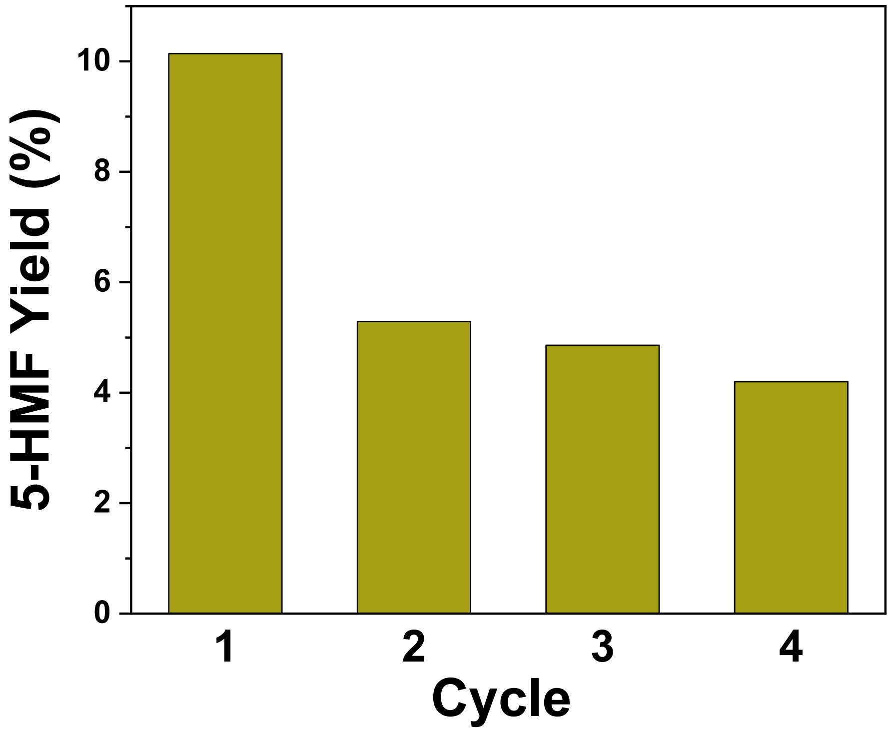

Fig. S11. Cycling stability of Amberlyst-15 in the conversion of NAG. Conditions: 0.1 g Amberlyst-15, 0.3 g NAG, 20 mL water, 150 ºC, 2h.

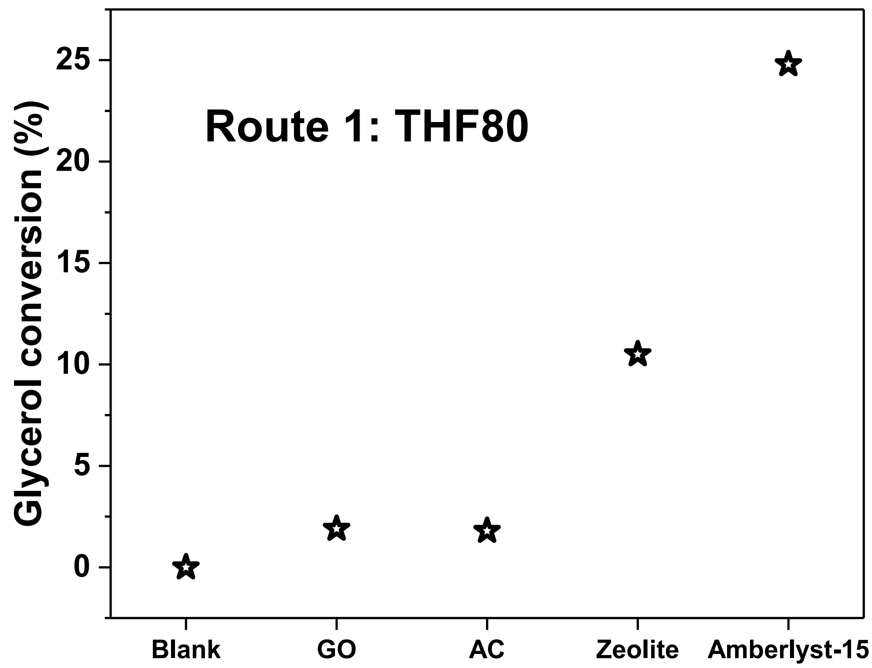

Figure S12. Glycerol conversion in Route 1 under THF80% solvent. Conditions: 10 mL solvent, 180 ºC, 2h, 0.21 g Chitin-BM mixture, 4.8 mg glycerol.

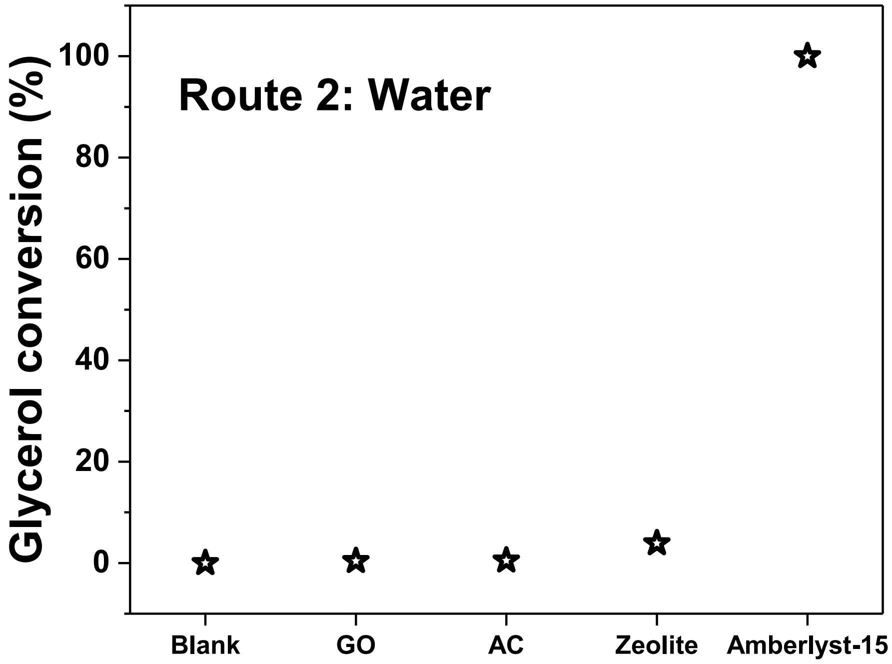

Figure S13. Glycerol conversion in Route 2 in water. Conditions: 10 mL water, 180 ºC, 2h, 0.1 g Chitin, 0.1 g catalyst, 4.8 mg glycerol.

Table S1. The comparison of the pristine and ball-milled Amberlyst-15 catalyst in Route 2 reaction. Conditions: 10 mL solvent, 2h, 4.8 mg glycerol, 0.1 g chitin+0.1 g Amberlyst-15.

Temperature/ ºC	Amberlyst-15	5-HMF yield/%	Monoacetin yield/%	Diacetin yield/%	Triacetin yield/%
150	Pristine	1.43	30.4	4.5	0
	Ball-milled	1.57	31.2	5.1	0.2
180	Pristine	2.24	11.0	55.2	33.5
	Ball-milled	2.09	12.1	53.5	32.1