

Supplementary Information

The relationship between oxidation and hydrolysis in the conversion of cellulose in NaVO₃/H₂SO₄ aqueous solution with O₂

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Table S1 The yields of acetic acid and levulinic acid in oxidation of cellulose at various temperatures and reaction times*

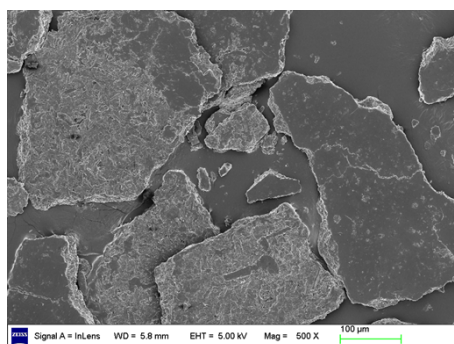
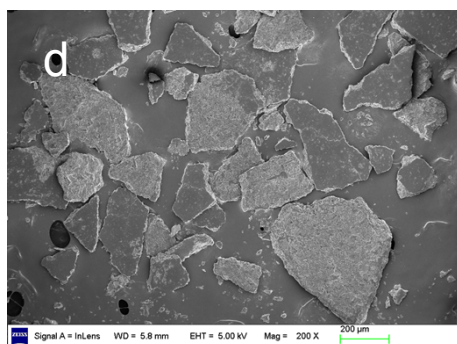
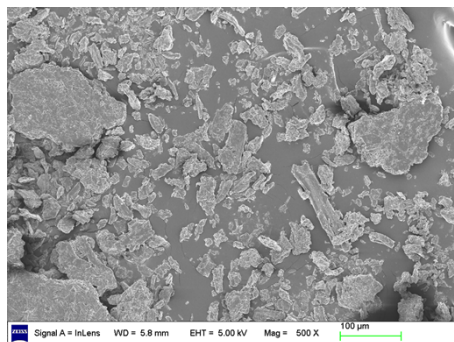
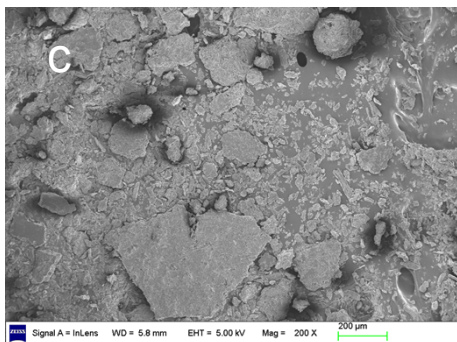
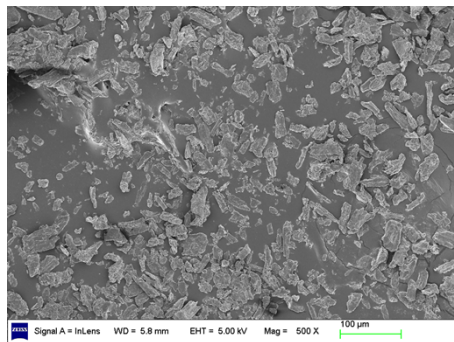
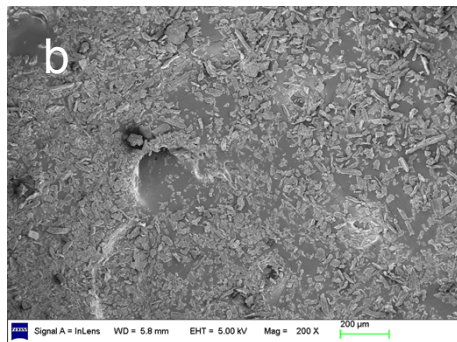
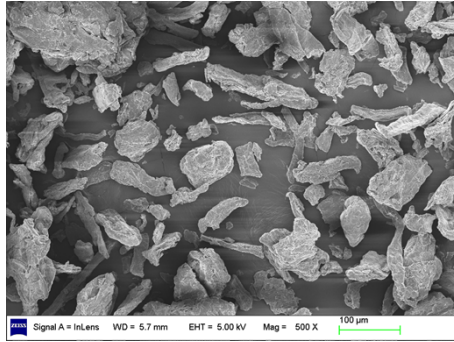
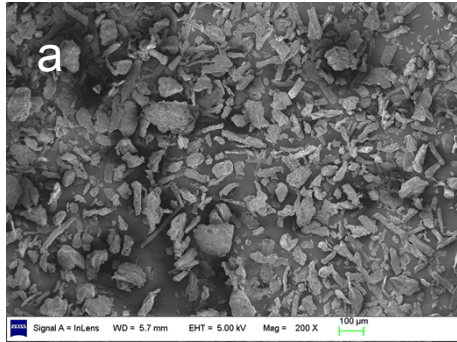
Temperature/°C	Time/min					
	2	5	10	20	30	60
140	0/1.8		0.3/1.5	0.2/1.5	0.9/2.8	0.5/1.6
150	1.1/1.5		0.3/1.9	1.1/2.0	1.3/0.8	
160	1.5/2.4	1.3/1.6	1.4/0.9	3.3/0.9		
170	2.3/1.8	1.6/2.4	5.2/1.0			
180	3.0/1.8	5.7/1.2	9.2/0.8			

* Data before and after slash stand for acetic acid and levulinic acid, respectively. Conditions: cellulose, 0.1 g; H₂SO₄, 2 wt%; NaVO₃, 0.35 wt%; H₂O, 6.0 cm³; O₂, 3 MPa.

Table S2 The yield ratios of acetic acid (AA) to FA at various temperatures

Temperature/°C	140	150	160	170
Yield ratio of AA to FA	0	0.033	0.034	0.038

Conditions: cellulose, 0.1 g; H₂SO₄, 2 wt%; NaVO₃, 0.35 wt%; H₂O, 6.0 cm³; O₂, 3 MPa; time, 2 min.



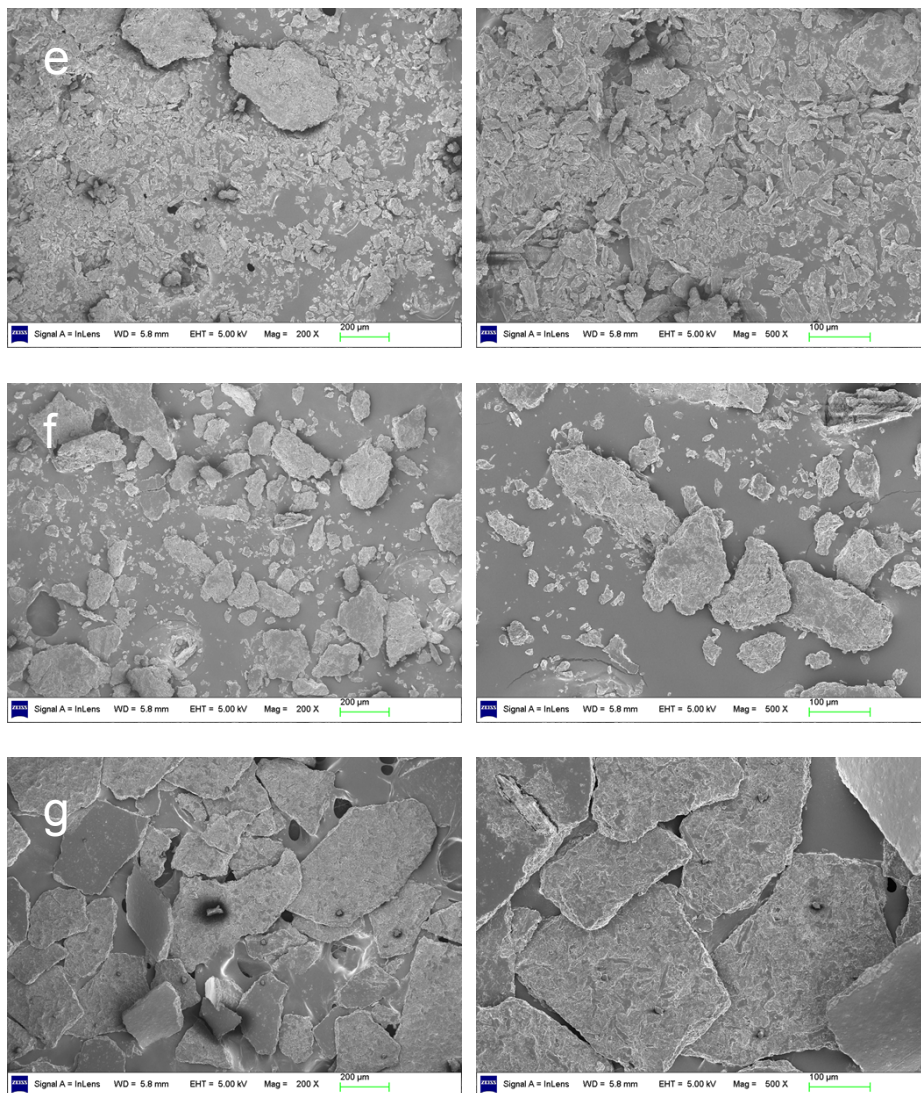


Fig. S1 SEM of residues after cellulose conversion with different magnification ($\times 200$ and $\times 500$). (a) represents cellulose without treatment, (b), (c) and (d) represent catalytic conversion of cellulose at 140 °C, 150 °C and 160 °C, respectively, (e), (f) and (g) represent hydrolysis of cellulose at 140 °C, 150 °C and 160 °C, respectively. Conditions: cellulose, 0.1 g; H_2SO_4 , 2 wt%; NaVO_3 , 0.35 wt% (only for catalytic conversion); H_2O , 6.0 cm^3 ; O_2 , 3 MPa (only for catalytic conversion); N_2 , 3 MPa (only for hydrolysis); time, 1 min.

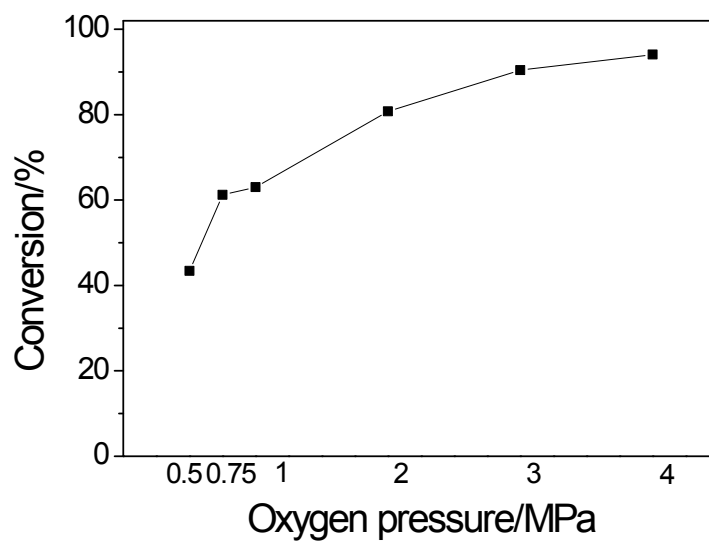


Fig. S2 The conversion of cellulose at various oxygen pressures. Conditions: cellulose, 0.1 g; H_2SO_4 , 2 wt%; NaVO_3 , 0.35 wt%; H_2O , 6.0 cm^3 ; time, 10 min.

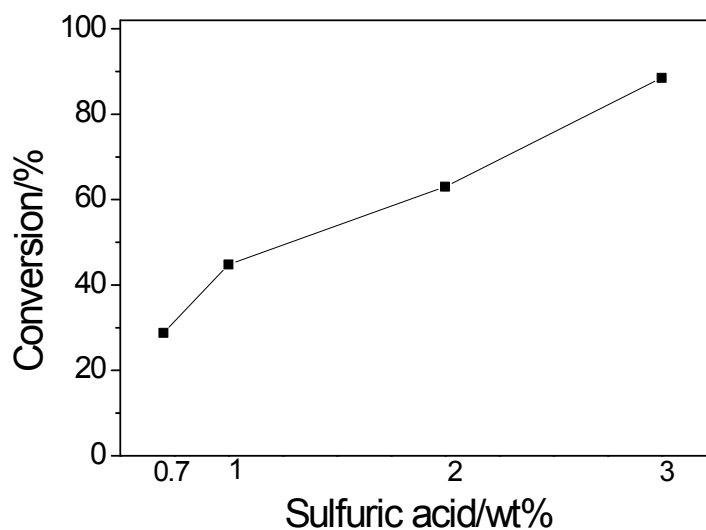


Fig. S3 The conversion of cellulose at various sulfuric acid concentrations. Conditions: cellulose, 0.1 g; NaVO_3 , 0.35 wt%; H_2O , 6.0 cm^3 ; O_2 , 1 MPa; time, 10 min.