

Structure dependent toxicity of lignin phenolics and PEG detoxification in VHG ethanol fermentation

Xiumei Liu, Peifang Yan, Wenjuan Xu, and Z. Conrad Zhang*

State Key Laboratory of Catalysis, Dalian National Laboratory for Clean Energy, Dalian Institute of Chemical Physics, Chinese Academy of Sciences, Dalian 116023, P. R. China. E-mail: zczhang@yahoo.com.

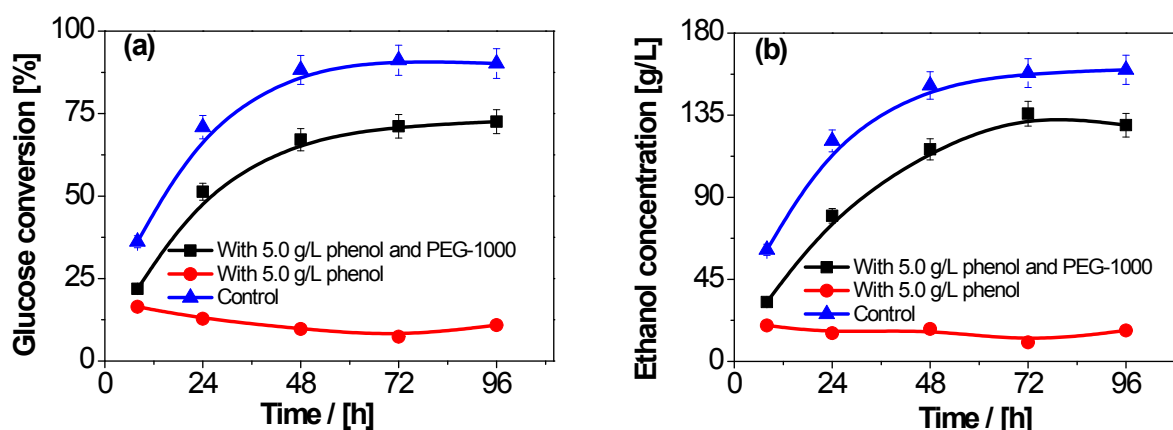


Fig. S1 The inhibitory effects of 5.0 g/L phenol on glucose conversion, ethanol concentration in the presence and absence of PEG-1000. **(a)** The inhibitory effects of 5.0 g/L phenol on glucose conversion. **(b)** The inhibitory effects of 5.0 g/L phenol on ethanol concentration.

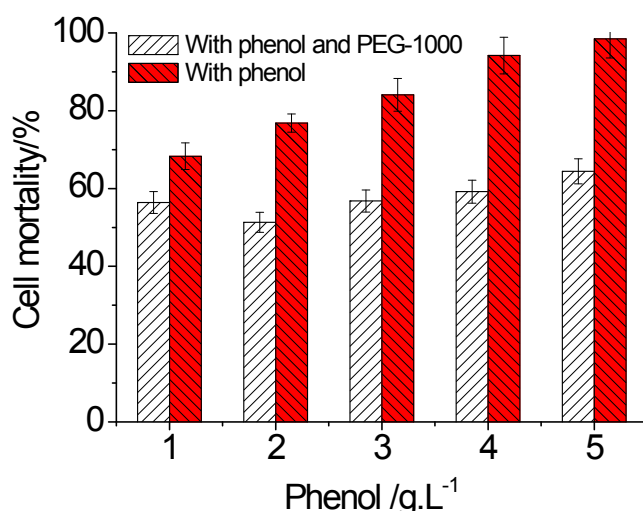


Fig. S2 Yeast cell mortality with or without PEG-1000 phenol from VHG fermentation at 48h. Fermentation conditions: 398 g/L glucose, approximately 5×10^8 cells/mL, 250 g/L of PEG-1000, 33 °C, 160 rpm, and pH of 4.3.

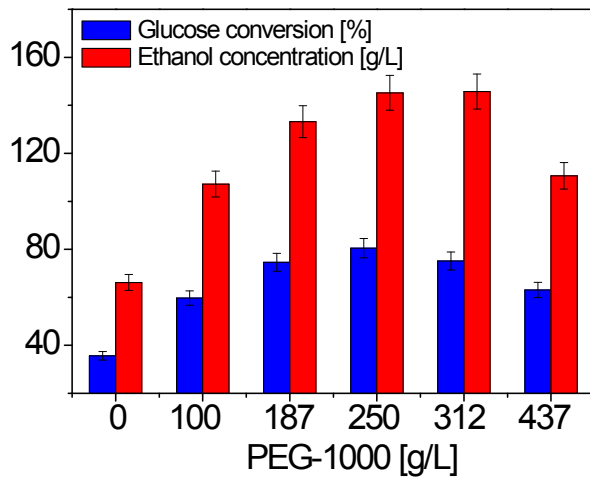


Fig. S3. The effect of PEG-1000 concentration on ethanol fermentation. Fermentation conditions: 398 g/L glucose, approximately 5×10^8 cells/mL, 5.0 g/L of guaiacol 250 g/L of PEG-1000, 33 °C, 160 rpm, and pH of 4.3.

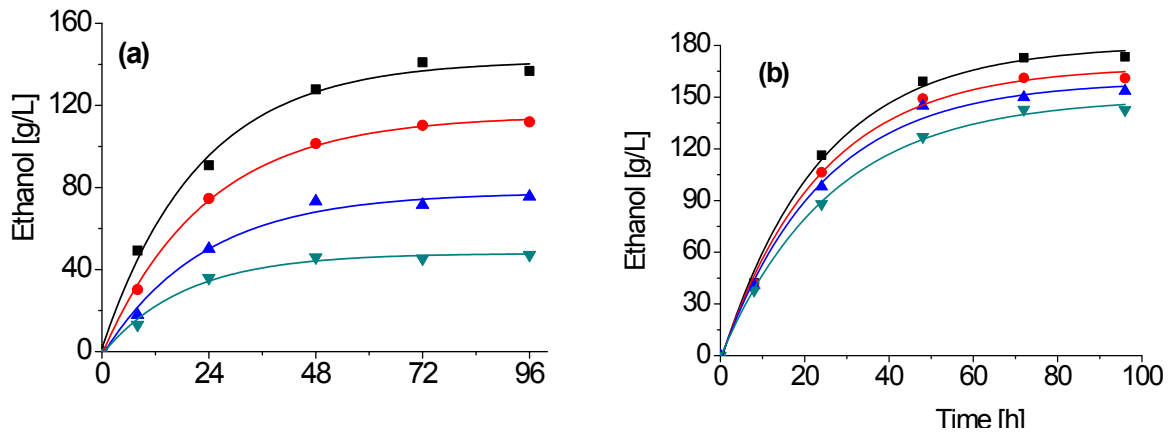


Fig. S4 Experimental and model profiles of VHG ethanol fermentation with different concentration of phenol. (a) without PEG-1000. (b) with PEG-1000. Fermentation conditions: 400 g glucose, approximately 5×10^8 cells/mL, 250 g/L of PEG-1000, 33 °C, 160 rpm, and pH of 4.3. Lines represent model predictions and symbols represent experimental data. ((■), 1.0g/L; (●), 2.0 g/L; (▲), 3.0 g/L; (▼), 4.0 g/L.

Table S1. The estimated the parameters P_{max} (g/L) (ethanol concentration above which cells do not produce ethanol) and v_{max} (g. L⁻¹. h⁻¹) (the highest specific rate of ethanol formation)

Phenol/g.L ⁻¹	Pure water		With PEG-1000	
	P_{max} [g/L]	v_{max} [g. L ⁻¹ . h ⁻¹]	P_{max} [g/L]	v_{max} [g. L ⁻¹ . h ⁻¹]
1	143.3	6.25	179.1	7.76
2	115.3	4.88	176.1	6.45
3	77.90	3.31	159.6	6.55
4	42.03	2.49	149.8	5.66