Electronic Supplementary Material (ESI) for Green Chemistry.

Supplementary Information

Selective production of 1,3-butadiene using glucose fermentation liquor

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- **Isomer ratio of 2,3-butanediol**

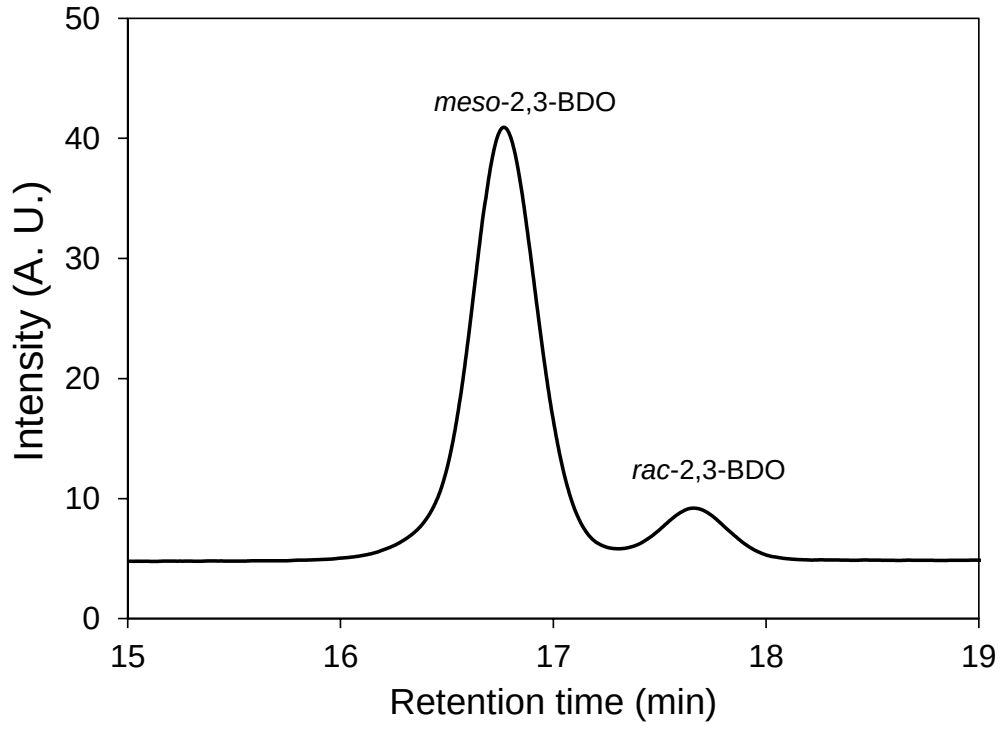
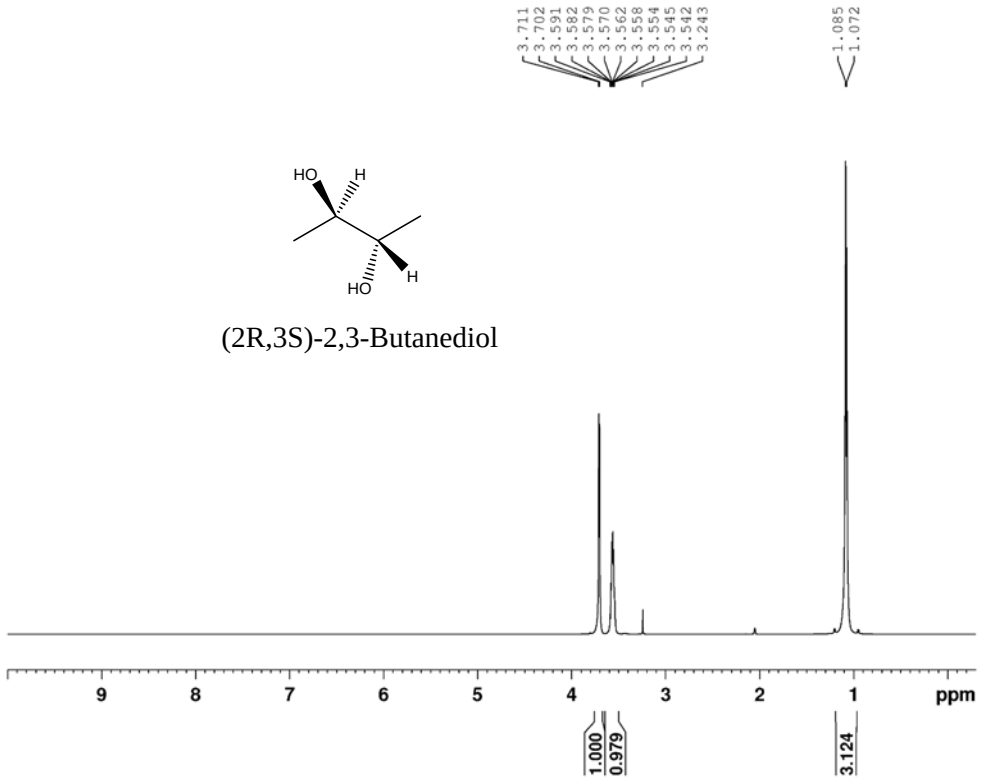


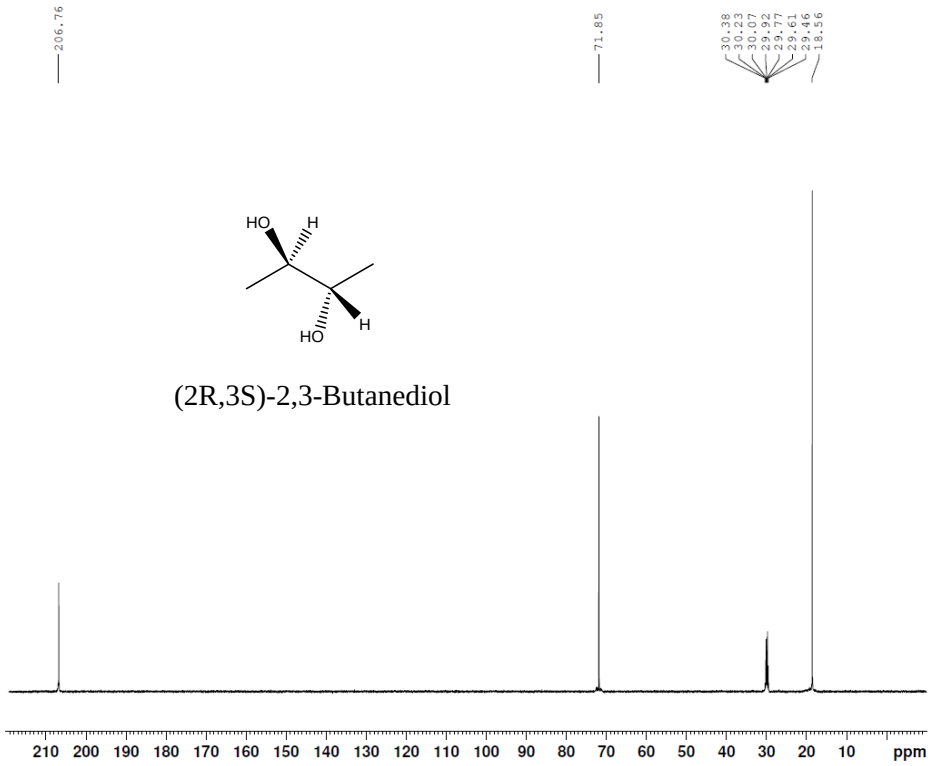
Fig. S1 HPLC chromatogram of used 2,3-butanediol (Menix international corporation, >97 % purity). The molar ratio between *meso* and *racemic* 2,3-butanediol is determined to be 9 : 1 which corresponds to the ratio of 2,3-butanediol derived from glucose fermentation by Klebsiella oxytoca KCTC12133BP (Korean Collection for Type Cultures, Daejeon, Korea).[1s]

- **NMR spectra of 2,3-butanediol**



(2R,3S)-2,3-Butanediol

Fig. S2 ^{1}H NMR spectra of meso 2,3-butanediol.



(2R,3S)-2,3-Butanediol

Fig. S3 ^{13}C NMR spectra of meso 2,3-butanediol.

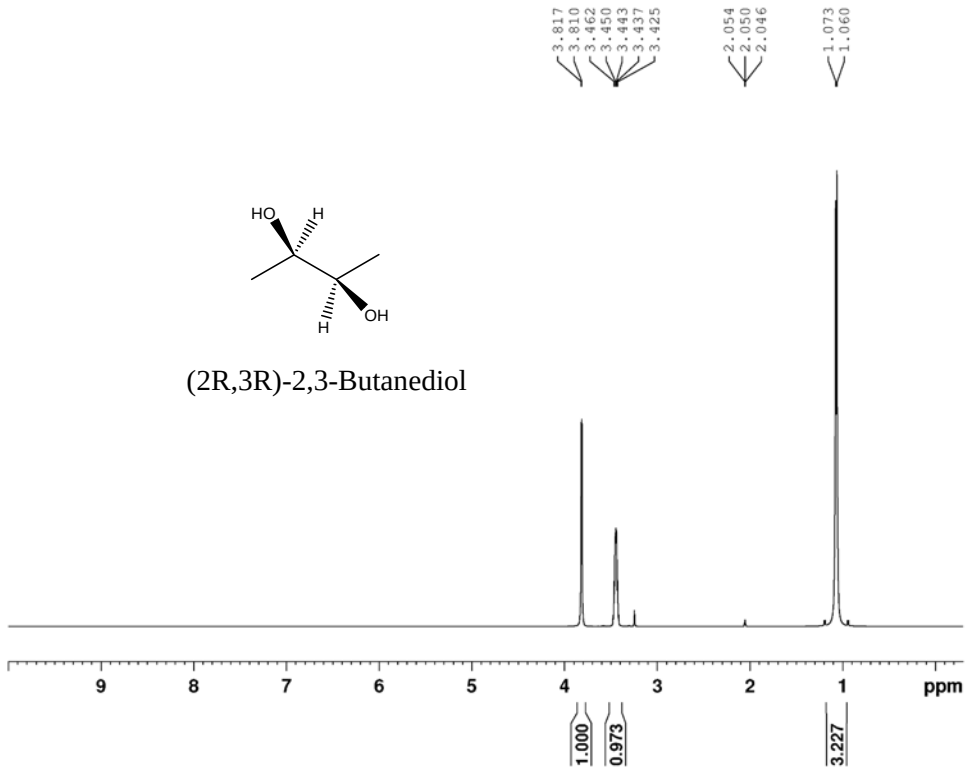


Fig. S4 [1]H NMR spectra of (2R,3R)-2,3-butanediol.

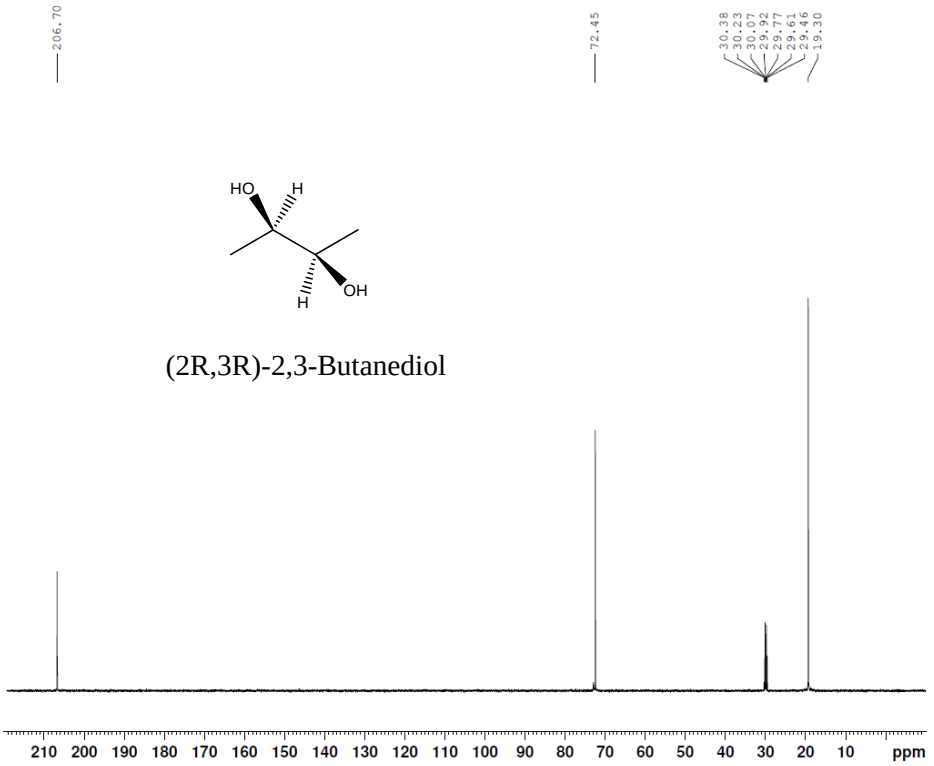


Fig. S5 [13]C NMR spectra of (2R,3R)-2,3-butanediol.

- **NMR spectra of used 2,3-butanediol**

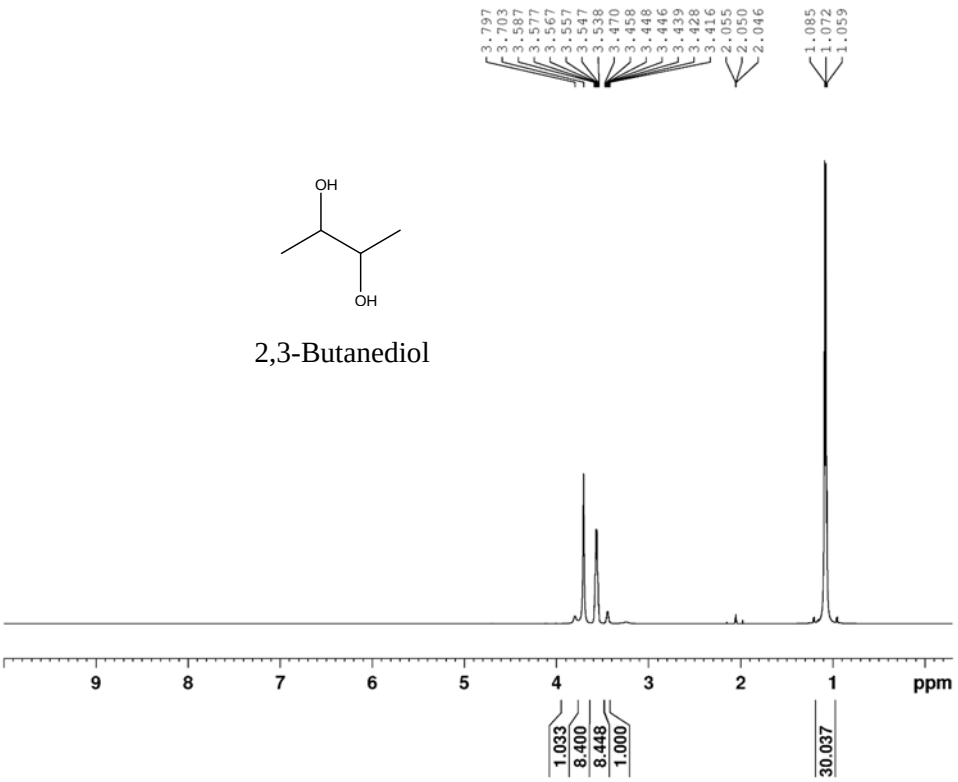


Fig. S6 [1]H NMR spectra of used 2,3-butanediol (Menix international corporation, >97 % purity).

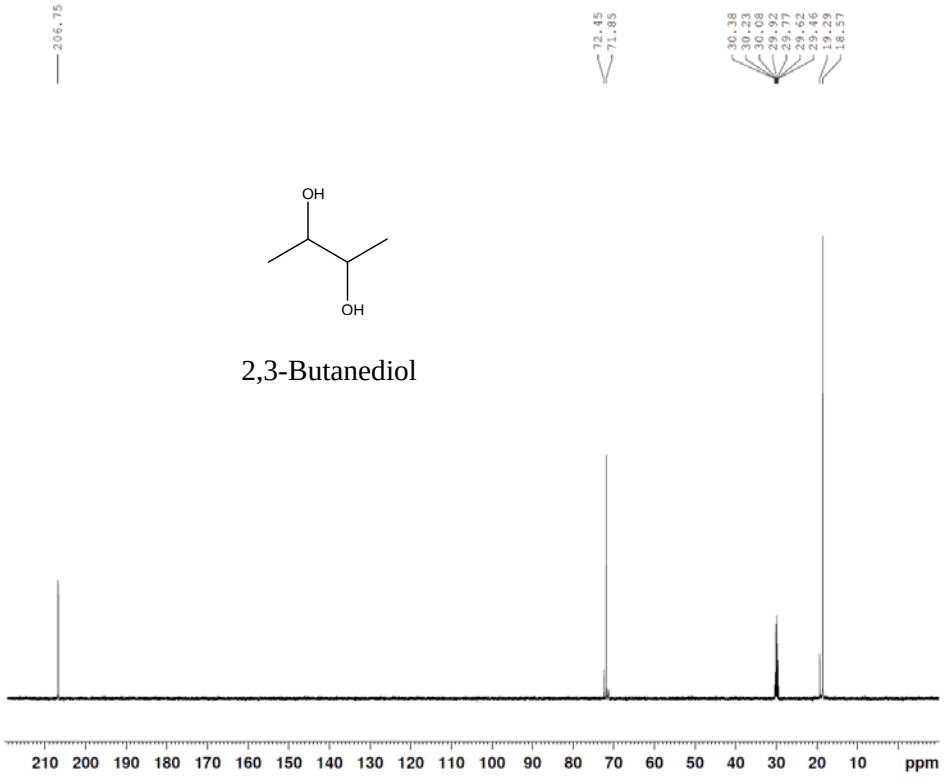


Fig. S7 [13]C NMR spectra of used 2,3-butanediol (Menix international corporation, >97 % purity).

- **NMR spectra of esterification products**

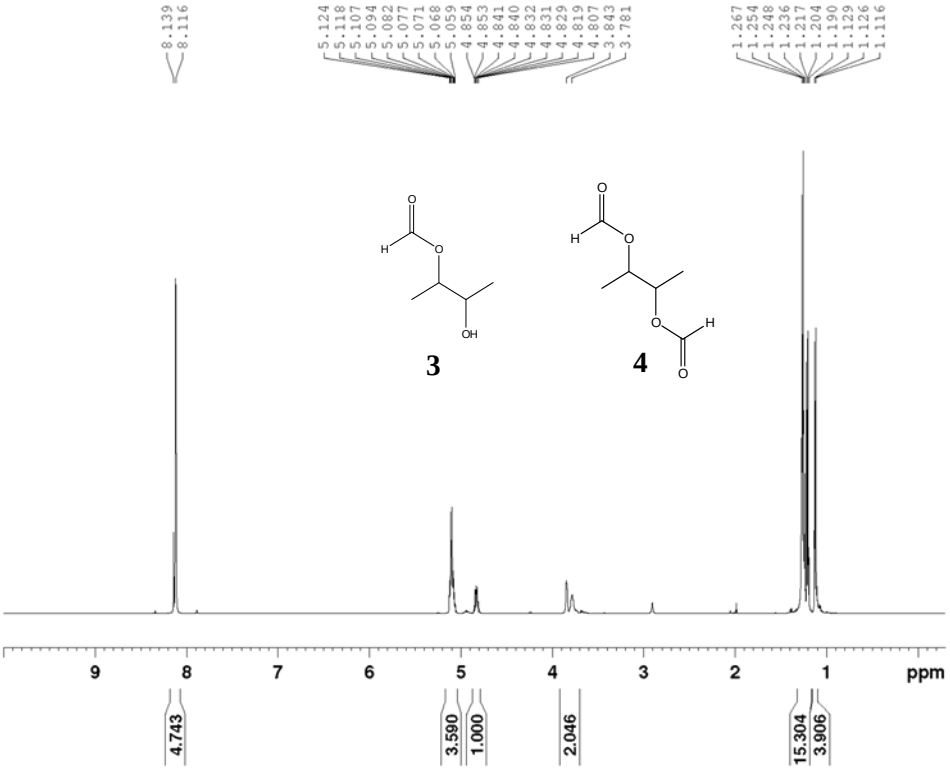


Fig. S8 [1]H NMR spectra of product **3** and **4**.

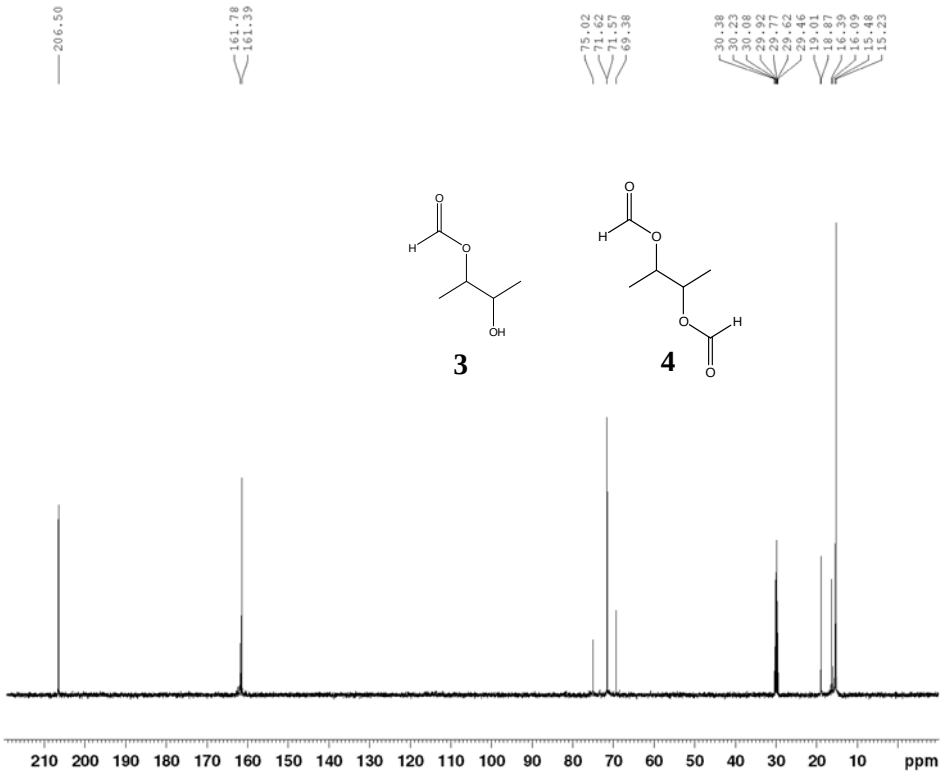


Fig. S9 [13]C NMR spectra of product **3** and **4**.

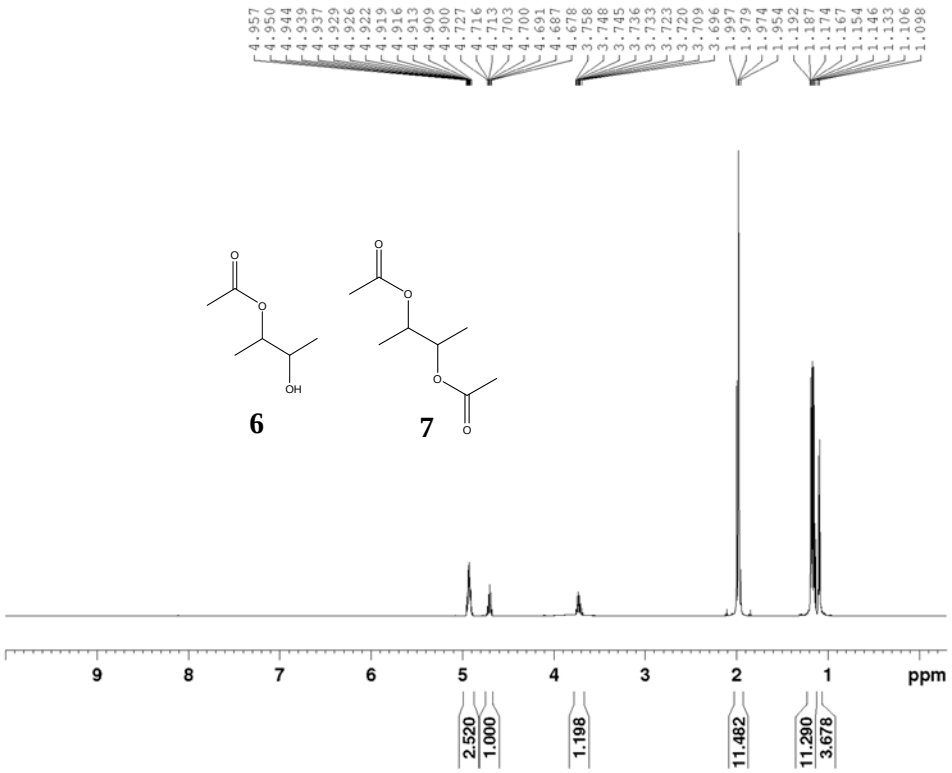


Fig. S10 ^{1}H NMR spectra of product **6** and **7**.

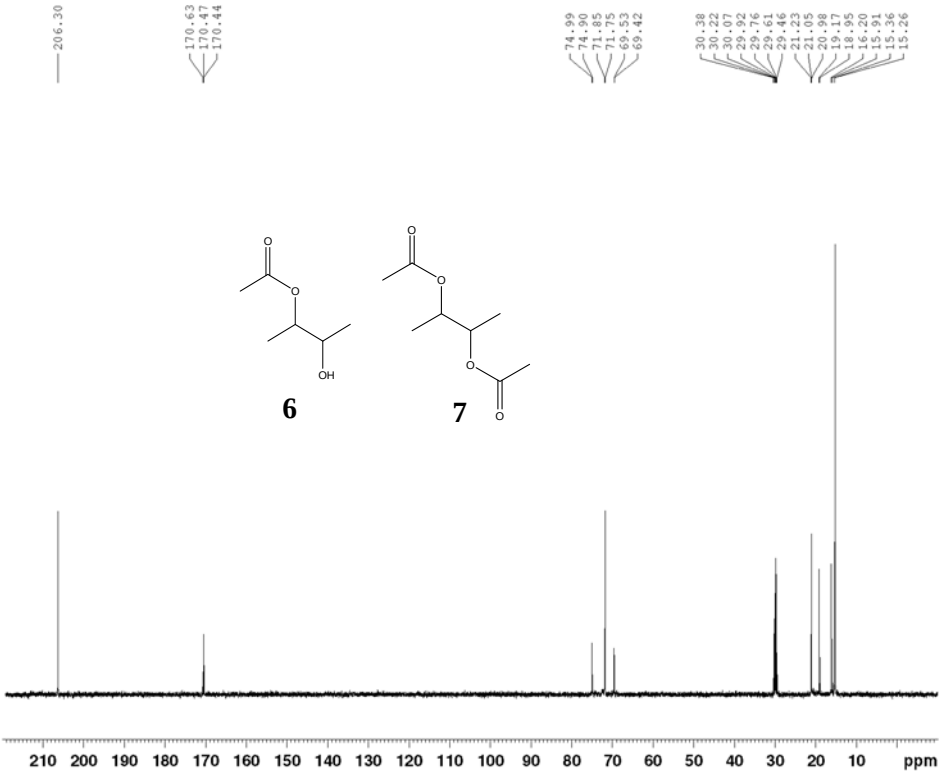


Fig. S11 ^{13}C NMR spectra of product **6** and **7**.

- **Photograph of esterification products**

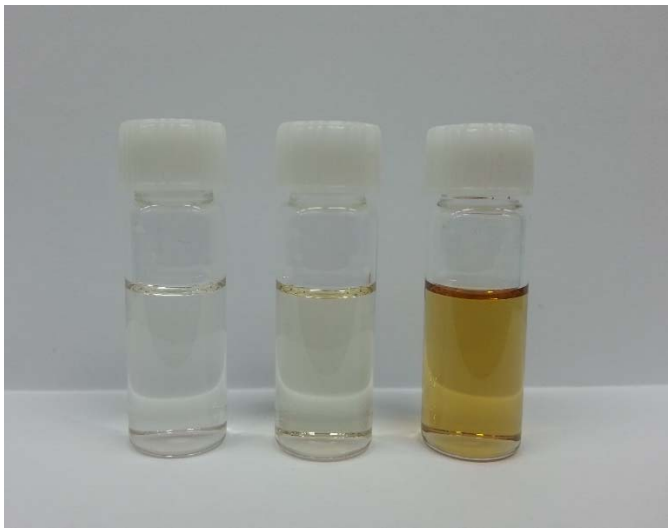


Fig. S12 Photograph showing the color change of the esterification products (Fig. 1) as a function of time; 1 h (left), 3 h (middle), and 5 h (right).

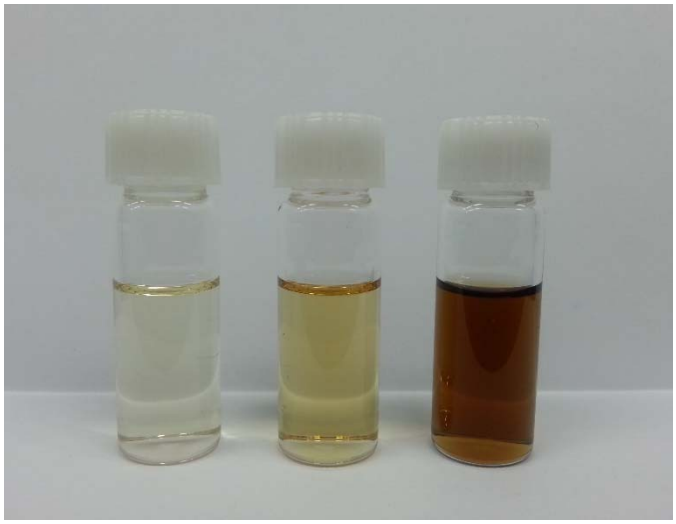


Fig. S13 Photograph showing the color change of the esterification products (Fig. 2) as a function of time; 3 h (left), 7 h (middle), and 10 h (right).

➢ **Gas phase stream**

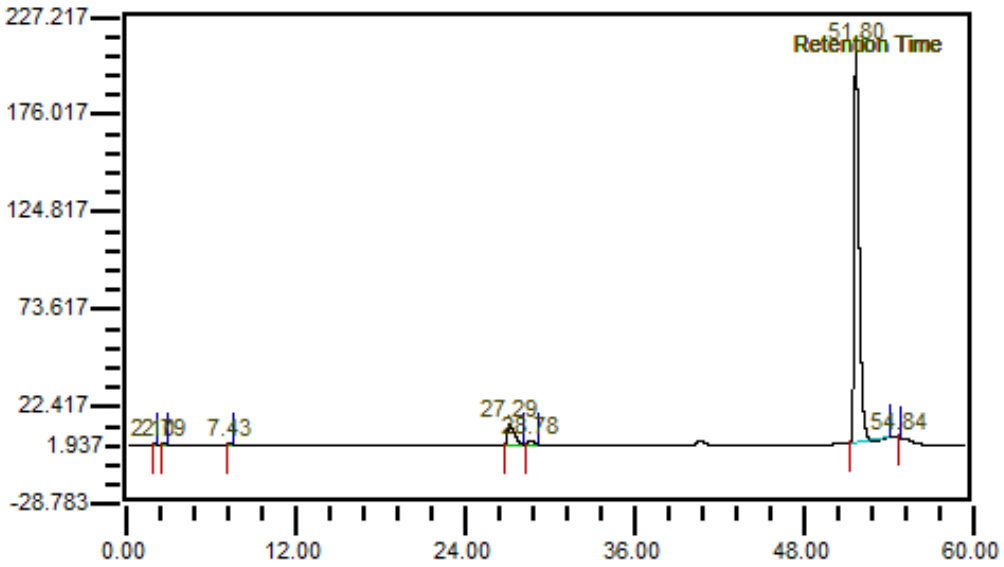


Fig. S14 GC chromatogram of the gas phase obtained from the pyrolysis of product **4** (Figure 1, 500 ^{o}C, 5 h, > 93 % purity by GC).

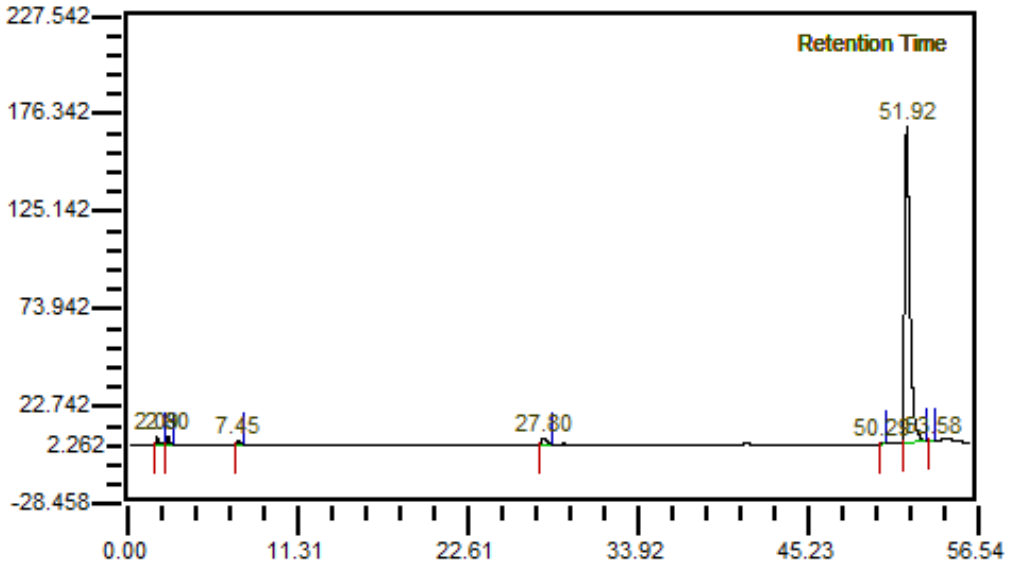


Fig. S15 GC chromatogram of the gas phase obtained from the pyrolysis of product **7** (Figure 1, 500 ^{o}C, 5 h, > 95 % purity by GC).

- **NMR spectra of esterification product using model mixture**

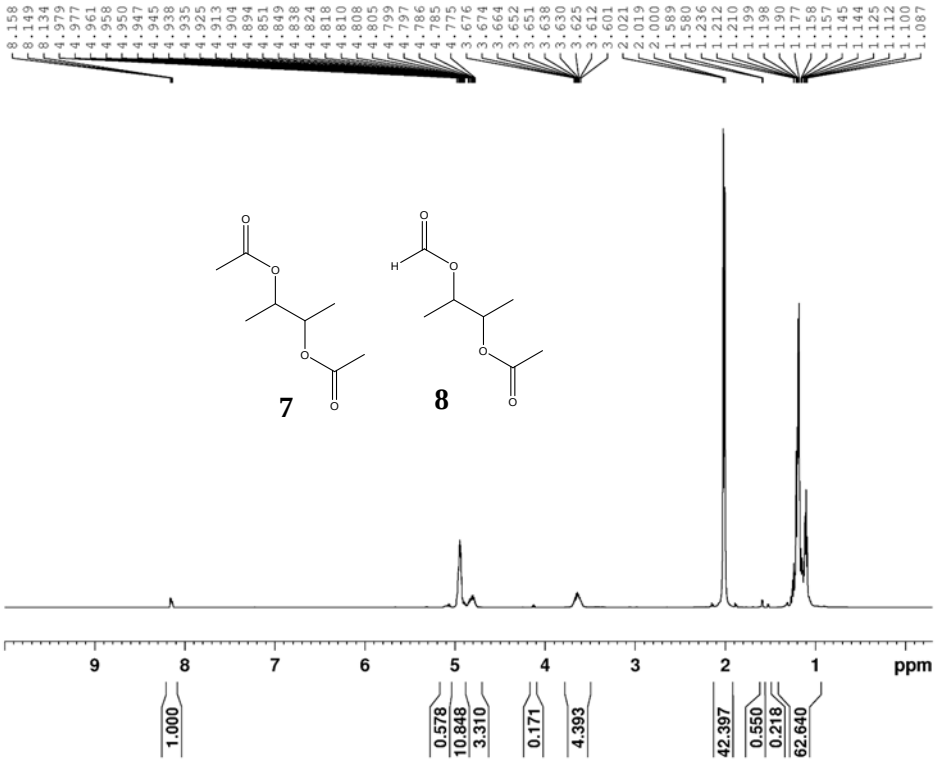


Fig. S16 ^{1}H NMR spectra of product **7** and **8**.

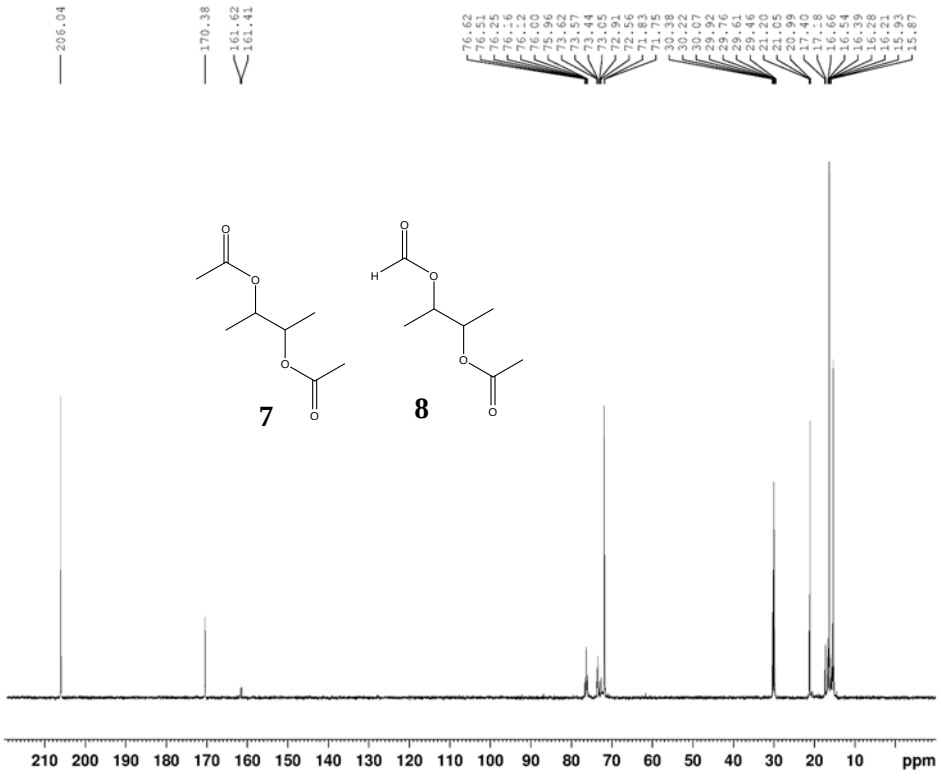


Fig. S17 ^{13}C NMR spectra of product **7** and **8**.

References

1S X. J. Ji, H, Huang, and P. K. Ouyang, Biotechnol. Adv., 2011, **29**, 351.