Electronic Supplementary Material (ESI) for Sustainable Energy & Fuels.

Supporting Information

Synthesis of jet fuel range high-density polycycloalkanes with vanillin and cyclohexanone

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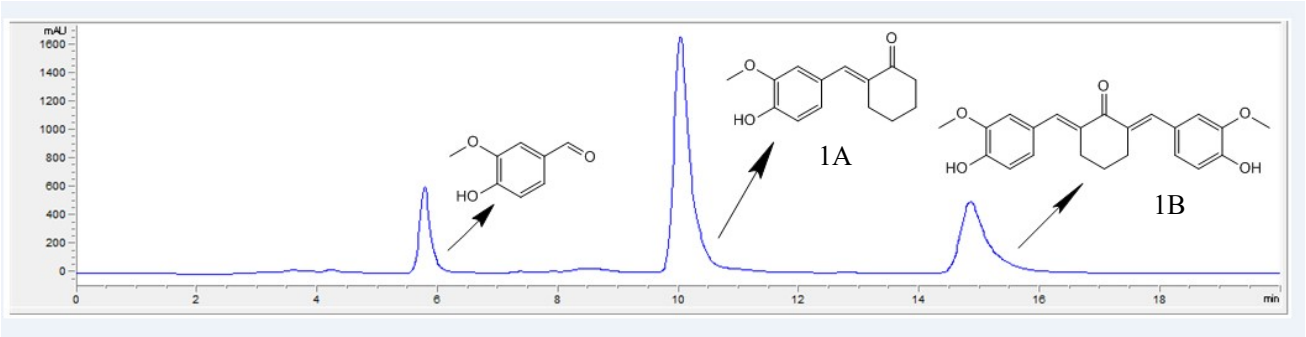

Figure S1. High performance liquid chromatography (HPLC) of the products from the aldol condensation of vanillin and cyclohexanone. Reaction conditions: 423 K, 4 h; 5 mmol vanillin, 15 mmol cyclohexanone and 0.05 g STNF were used in the test.

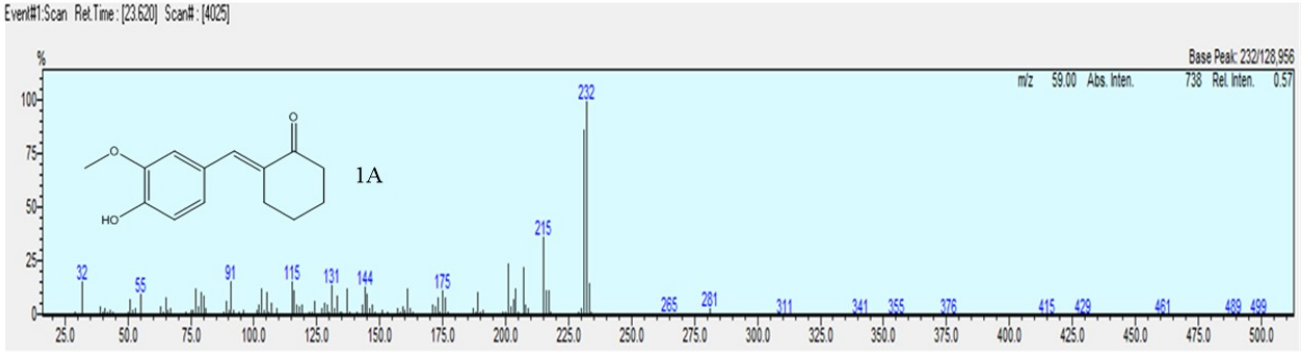

Figure S2. Mass spectrogram of **1A** from the aldol condensation of vanillin and cyclohexanone.

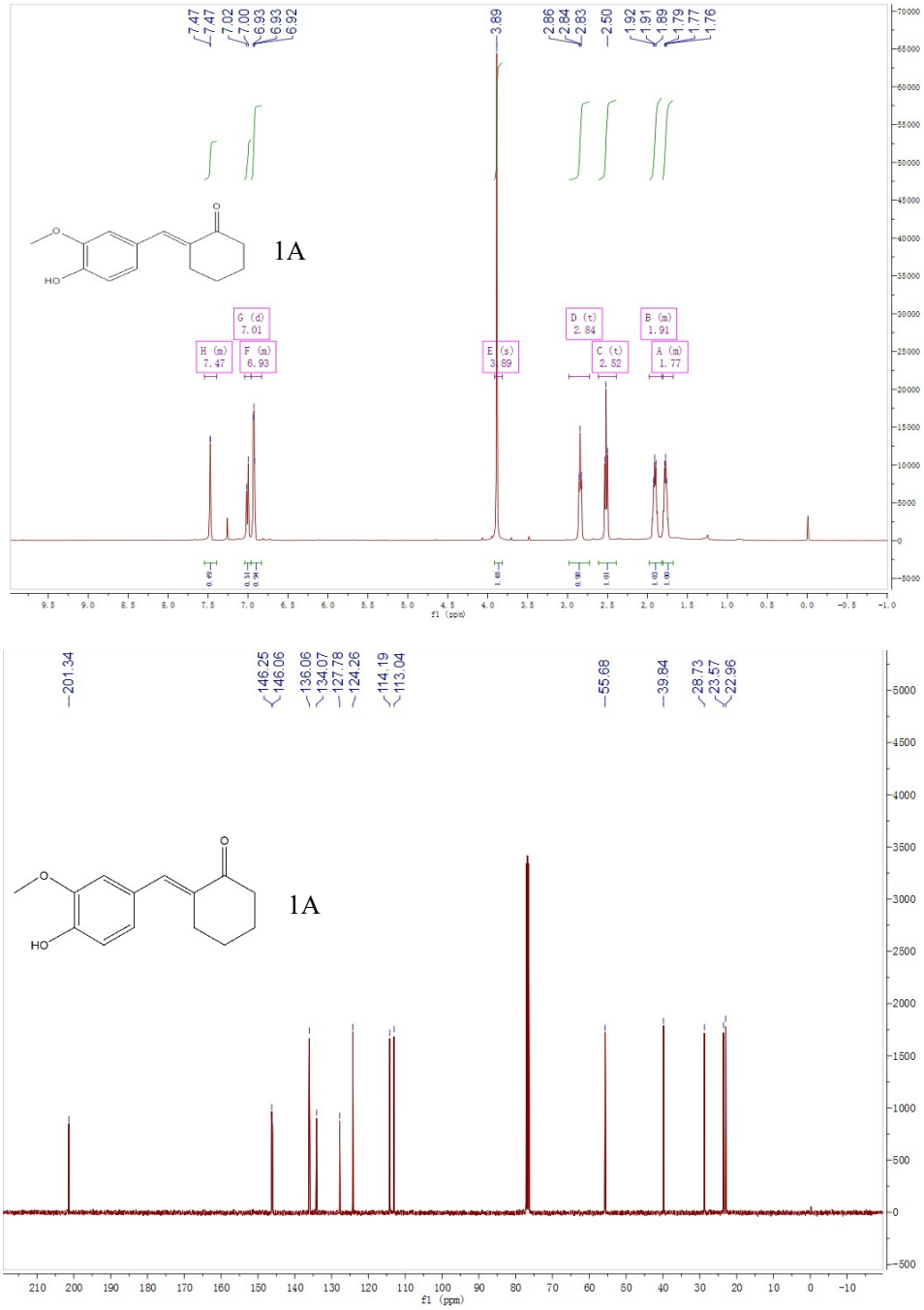

Figure S3. ^{1}H-NMR and ^{13}C-NMR spectra of the **1A** from the aldol condensation of vanillin and cyclohexanone.

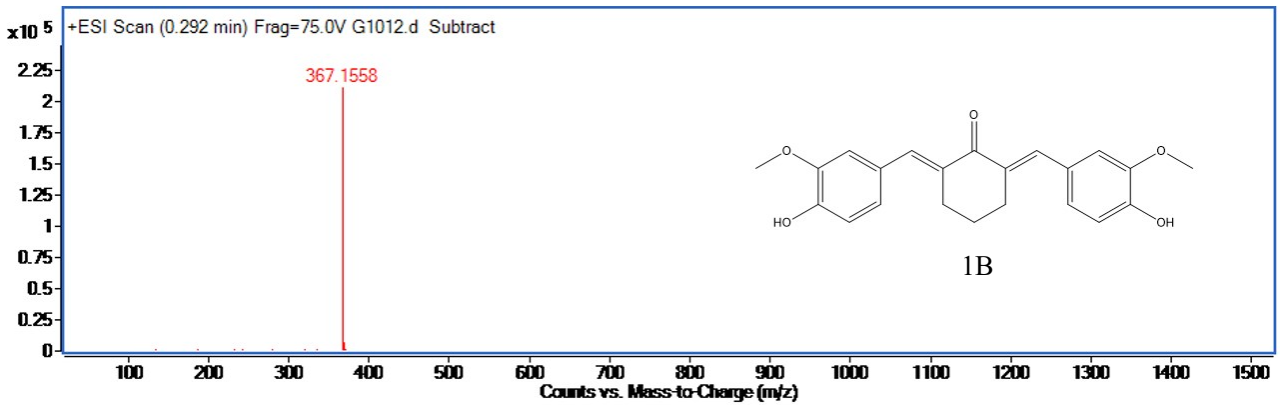

Figure S4. Mass spectrogram of **1B** from the aldol condensation of vanillin and cyclohexanone.

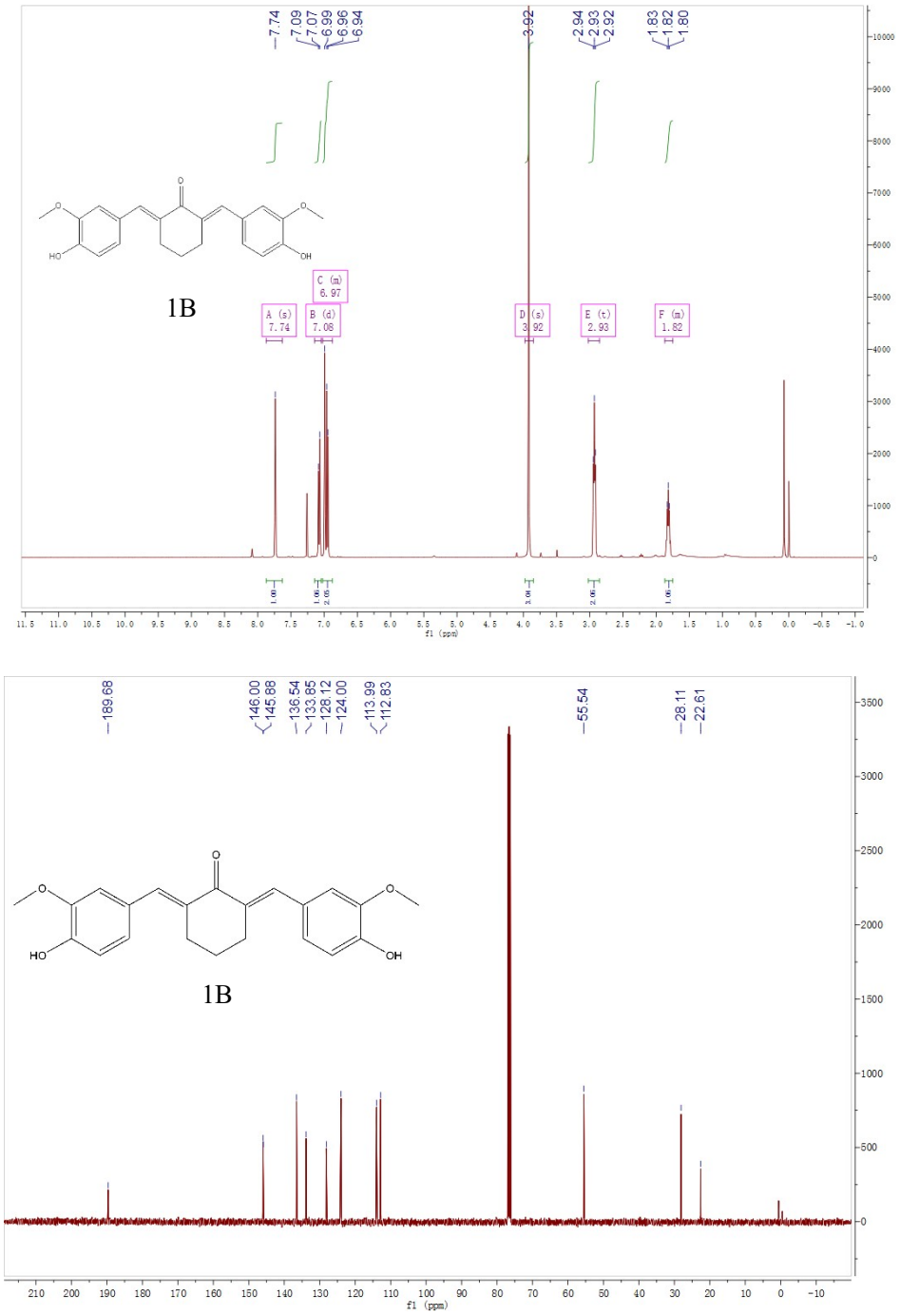

Figure S5. ^{1}H-NMR and ^{13}C-NMR spectra of the **1B** from aldol condensation of vanillin and cyclohexanone.

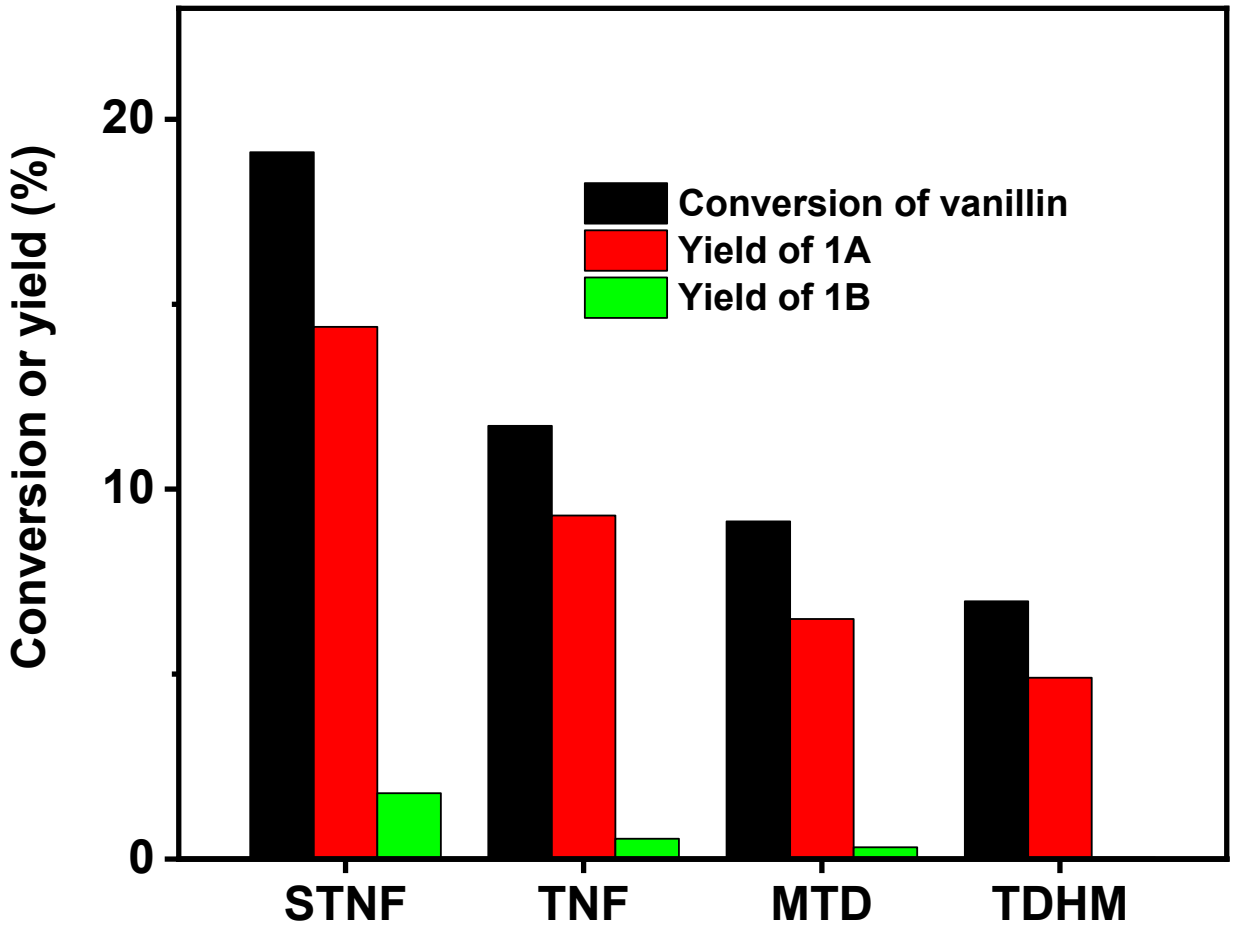

Figure S6. Conversion of vanillin and the yields of **1A** and **1B** over the titanium dioxide based nanometer material catalysts. Reaction conditions: 373 K, 4 h; 5 mmol vanillin, 5 mmol cyclohexanone and 0.025 g catalyst were used for each test.

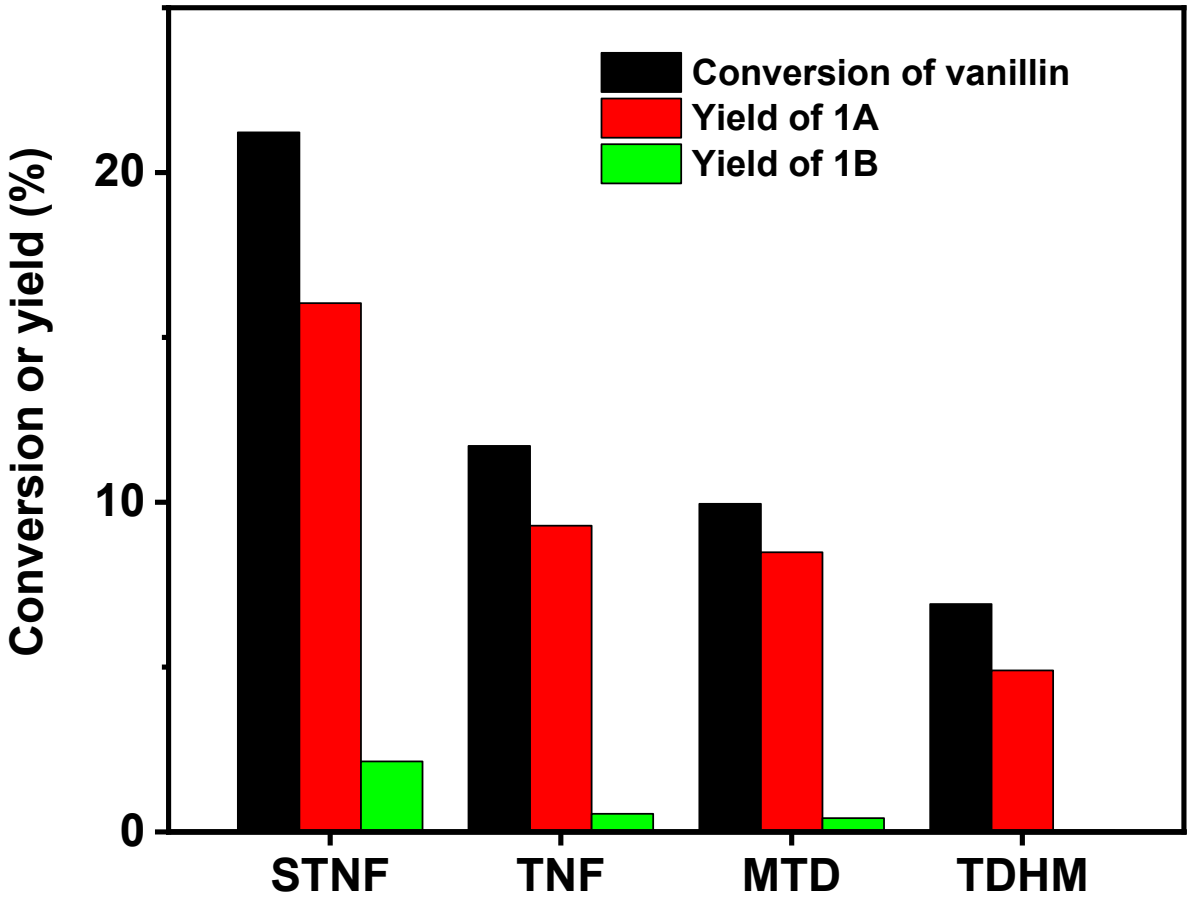

Figure S7. Conversion of vanillin and the yields of **1A** and **1B** over the titanium dioxide based nanometer material catalysts. Reaction conditions: 373 K, 4 h; 5 mmol vanillin, 5 mmol cyclohexanone were used in each tests. The surface areas of catalysts were fixed as 8.8 m^2 by controlling the masses of catalysts (0.032 g STNF, 0.025 g TNF, 0.049 g MTD, 0.025 g TDHM) according to their specific BET surface areas measured by N_2-physisorption.

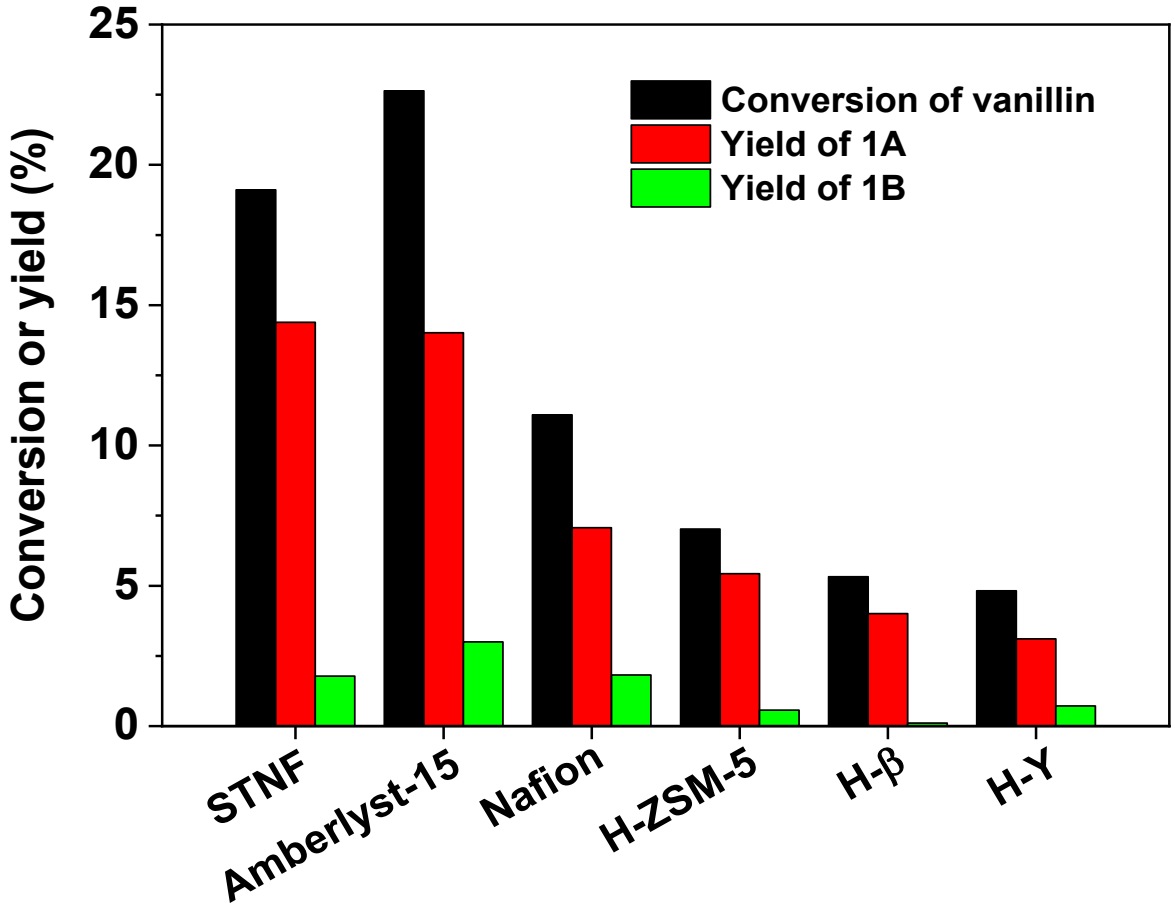

Figure S8. Conversion of vanillin and the yields of **1A** and **1B** over STNF and some commercial acid catalysts. Reaction conditions: 373 K, 4 h; 5 mmol vanillin, 5 mmol cyclohexanone, 0.025 g catalysts were used for each test.

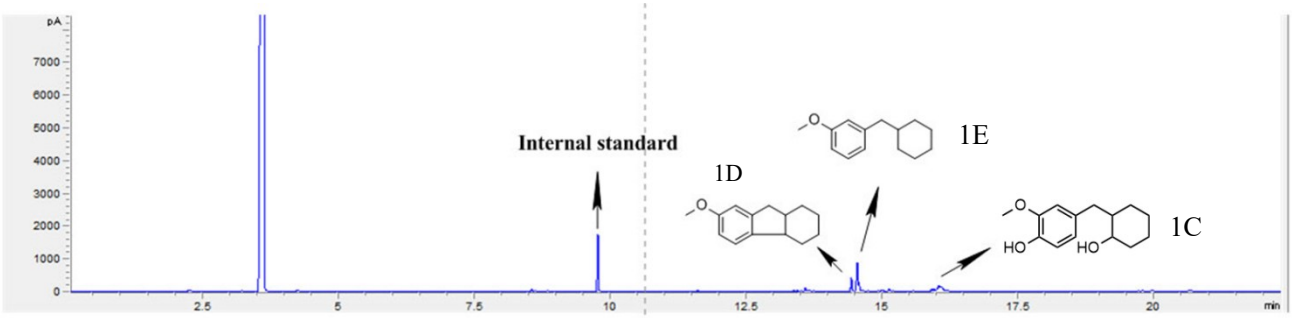

Figure S9. Gas chromatography of the product from the HDO of **1A** over the Pt/C catalyst. Reaction conditions: 443 K, 4 MPa H_2, 4 h; 5 mmol **1A** and 0.1 g Pt/C were used in the test.

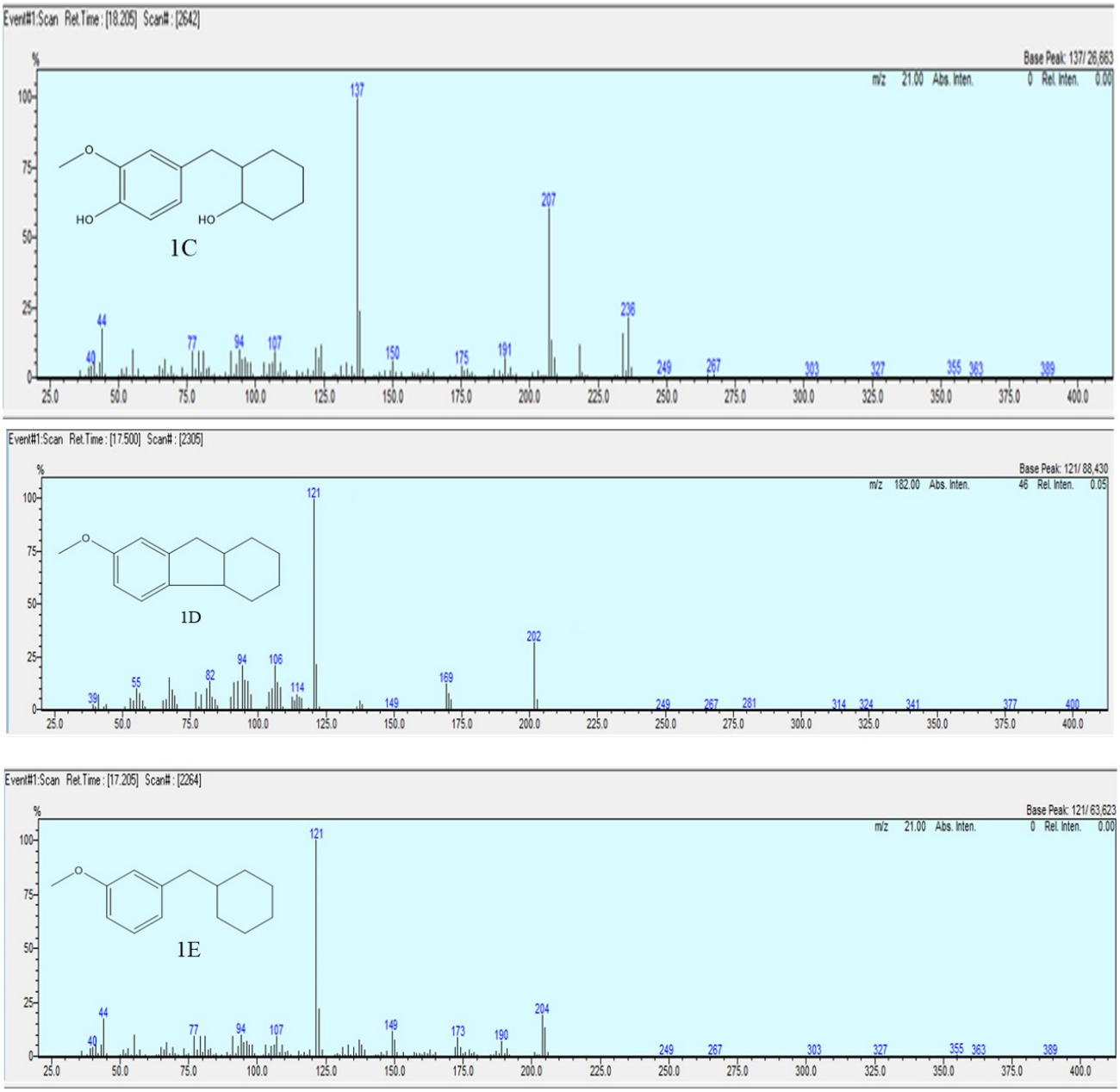

Figure S10. Mass spectrograms of **1C**, **1D** and **1E** from the HDO of **1A**.

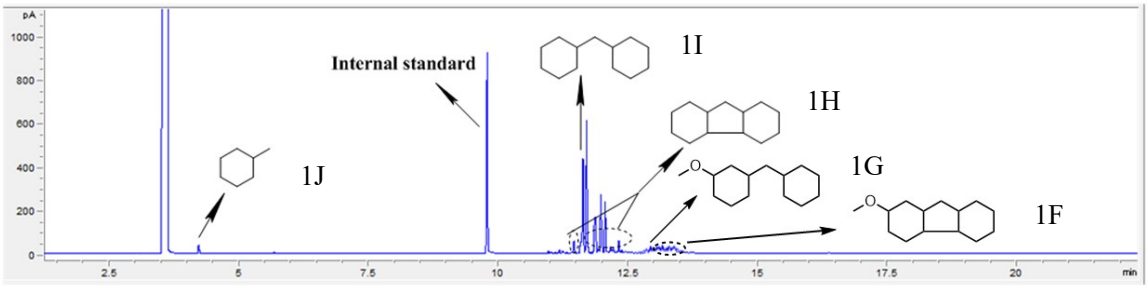

Figure S11. Gas chromatography of the product from the HDO of **1A**. Reaction conditions: 473 K, 6 MPa H_2, 4 h; 5 mmol vanillin, 0.1 g Pd/C and 1 g H-Y were used in the test.

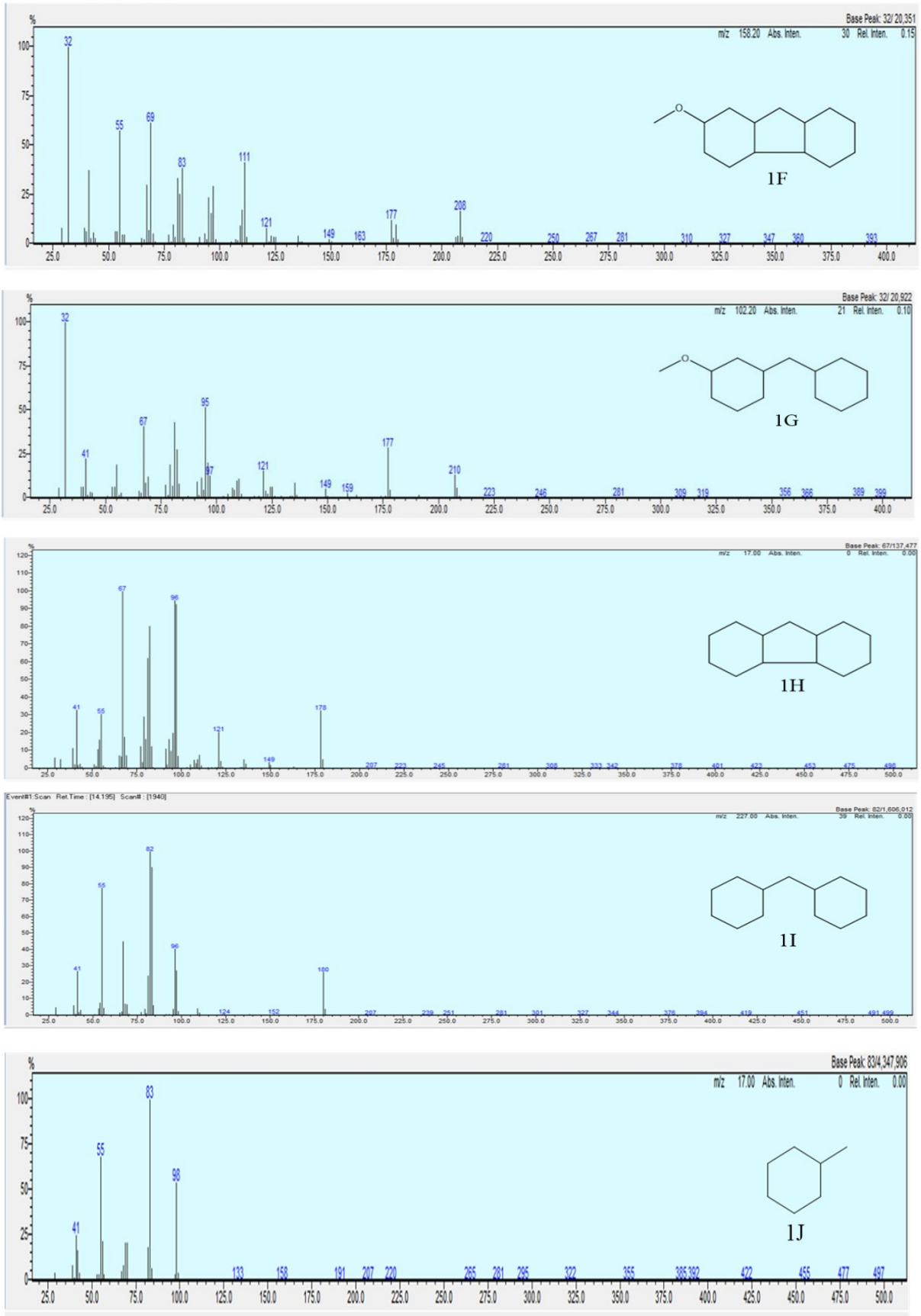

Figure S12. Mass spectrograms of **1F**, **1G**, **1H** and **1J** from the HDO of **1A**.

Table S1. Metal dispersions and average particle sizes of the M/C catalysts measured by CO-chemisoption.

Catalyst	Metal dispersion (%)	Particle size (nm)
Pd/C	1.55	64.6
Ru/C	2.47	40.4
Pt/C	2.75	36.3

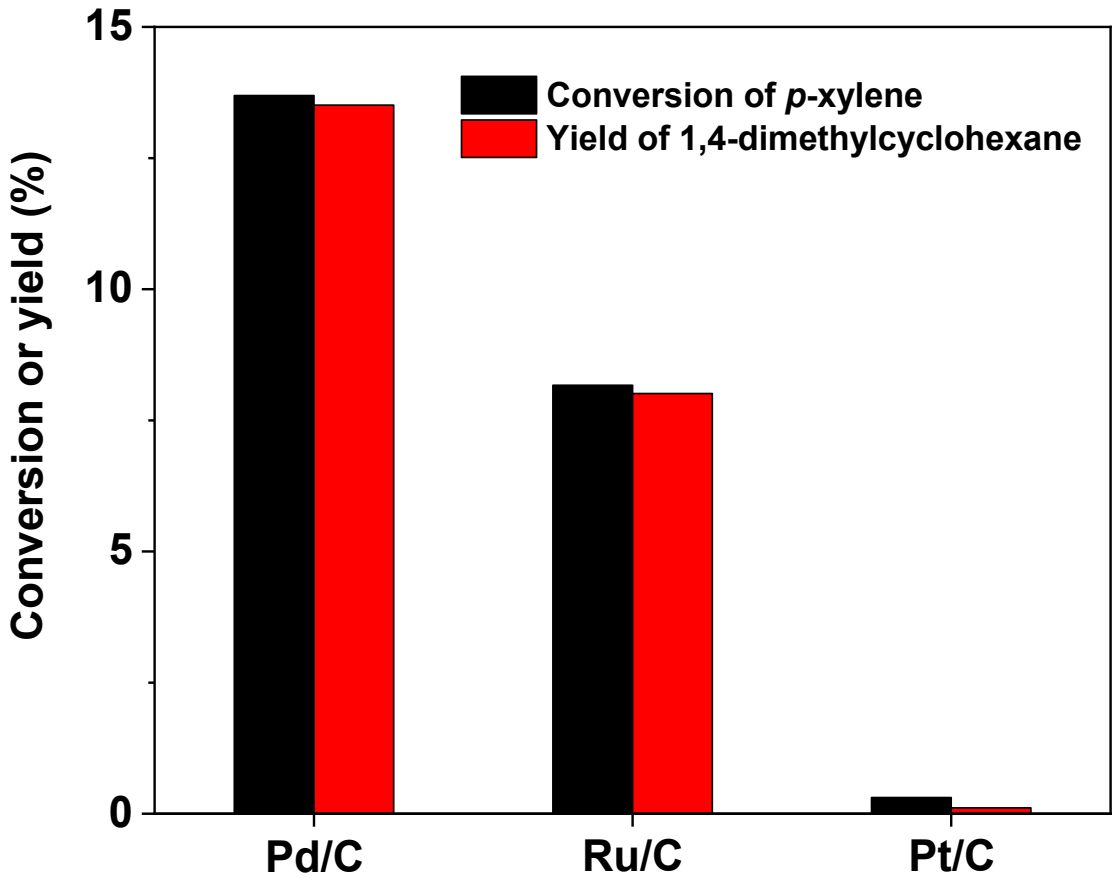

Figure S13. Conversion of *p*-xylene and the yield of 1,4-dimethylcyclohexane over the M/C catalyst (M = Pd, Ru, Pt). Reaction conditions: 2 MPa H_2, 413 K, 0.5 h; 5 mmol *p*-xylene, 10 mL cyclohexane (used as solvent) and 0.025 g catalyst were used in each test.