

# Supporting Information

## Water-assisted ketonization of methyl palmitate to palmitone over metals incorporated TiO<sub>2</sub> catalysts

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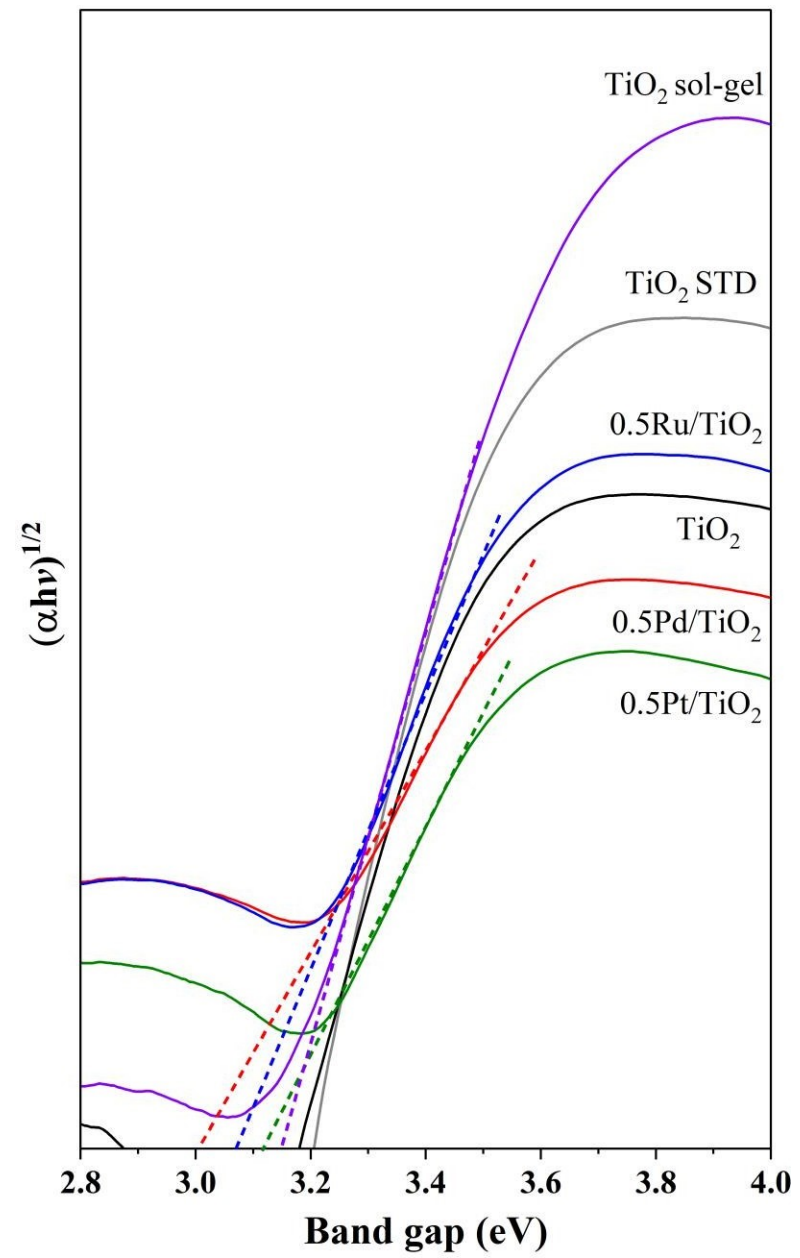
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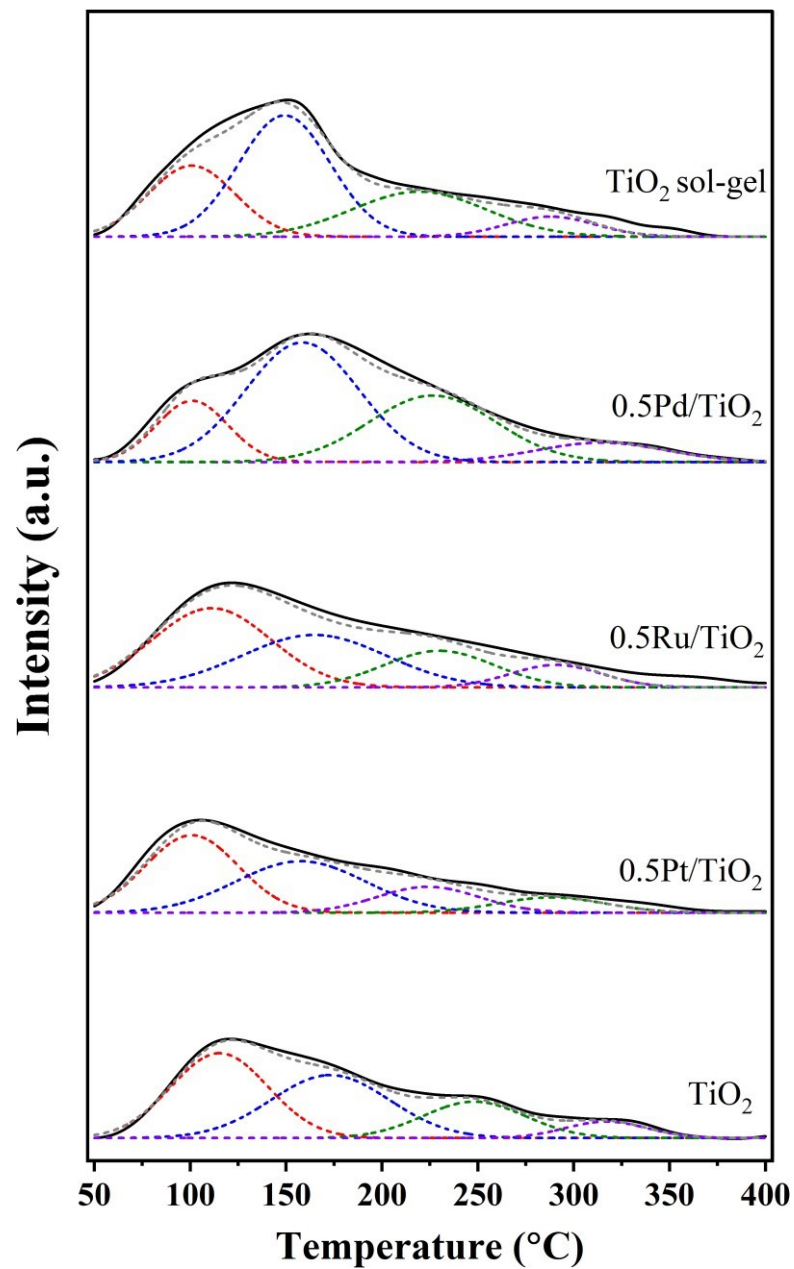
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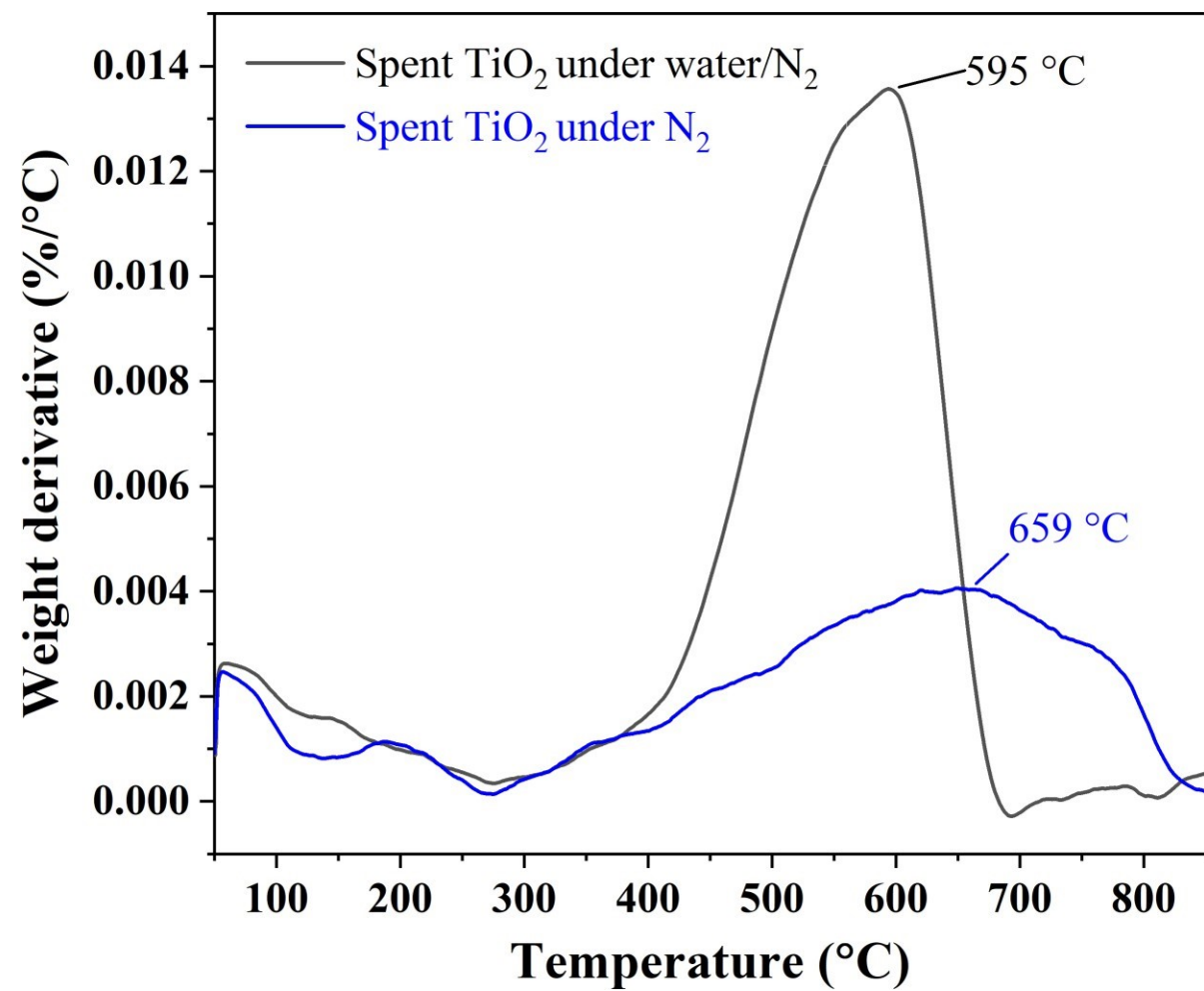


**Fig. S1.** Tauc plot of reduced catalysts

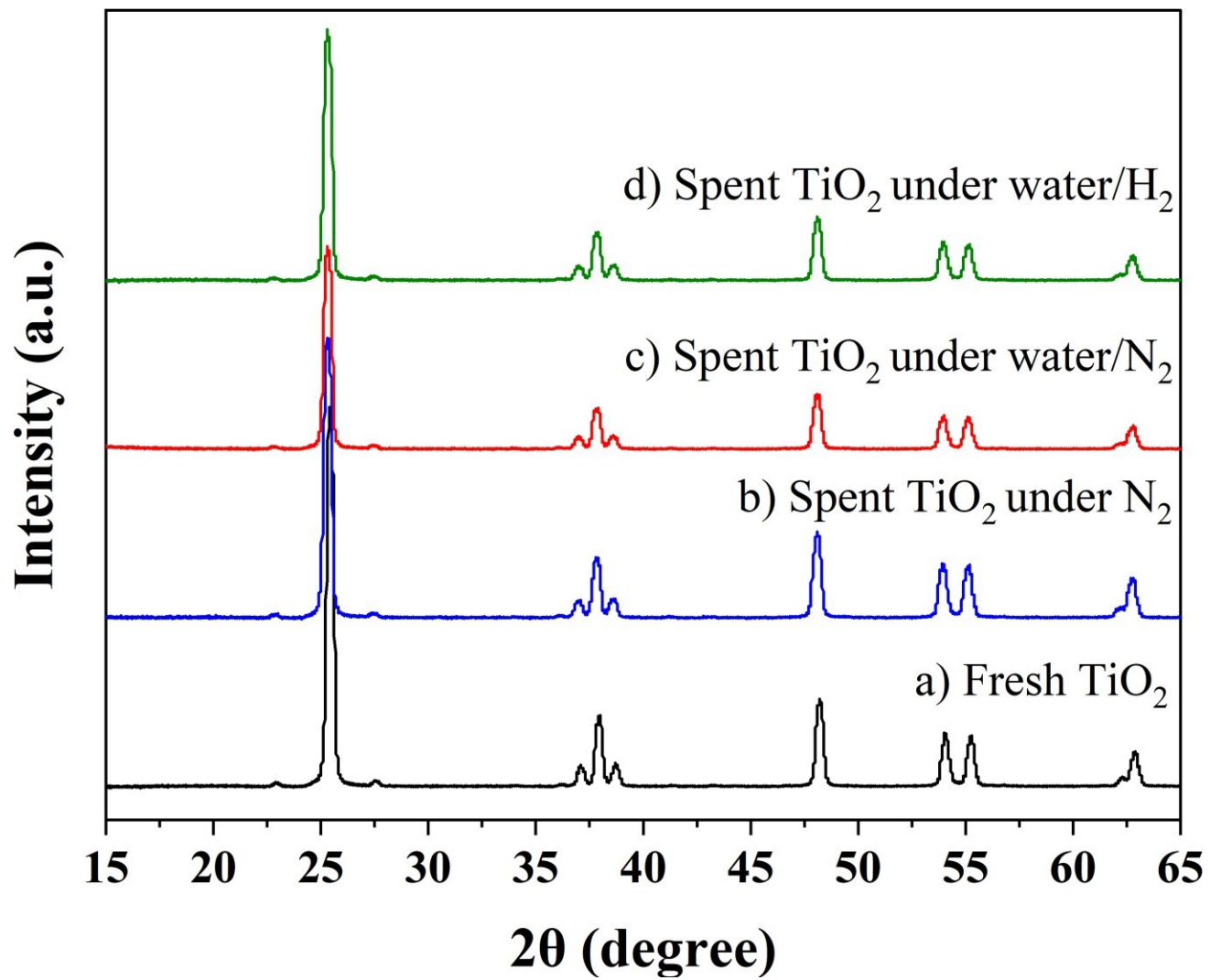


**Fig. S2.** NH<sub>3</sub>-TPD of reduced catalysts

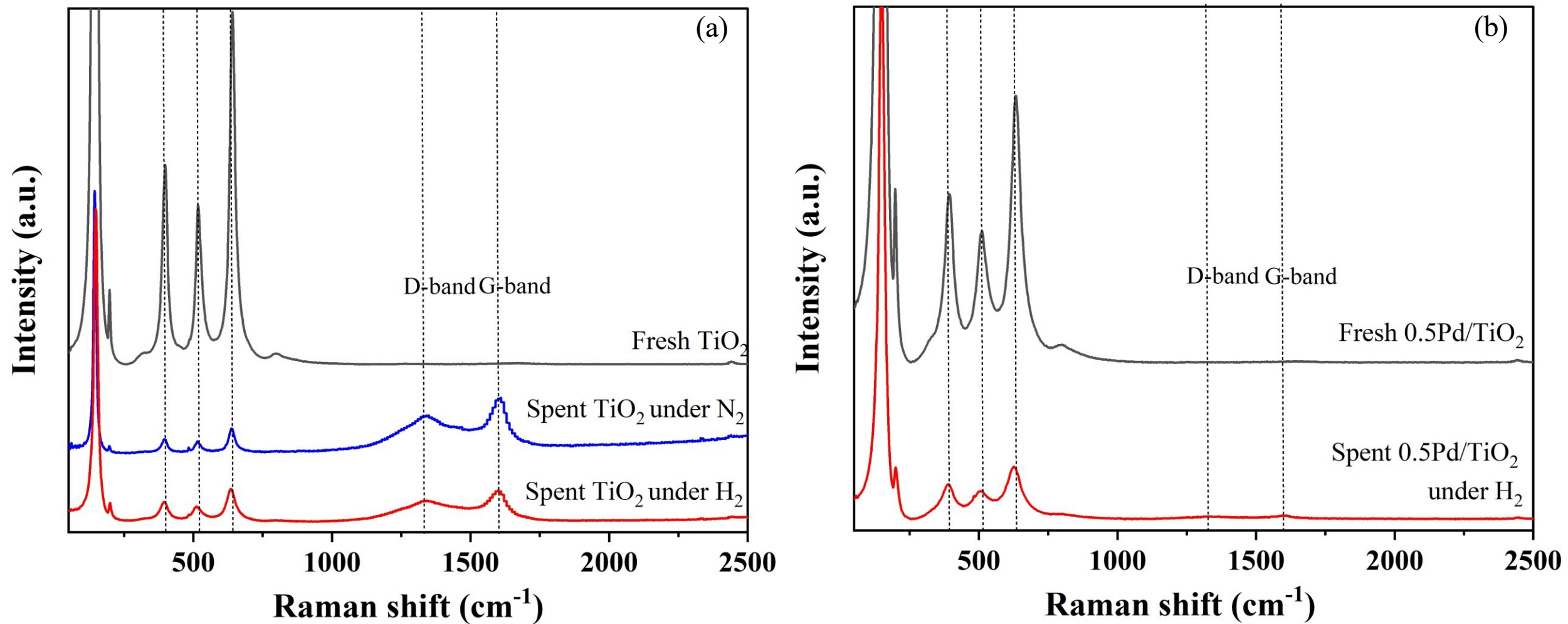
Entry	Catalyst	Acidity (μmol/g)		
		Weak	Medium	Strong
1	TiO <sub>2</sub>	3.70	1.90	0.58
2	0.5Pt/TiO <sub>2</sub>	2.83	0.80	1.50
3	0.5Ru/TiO <sub>2</sub>	4.20	1.60	0.60
4	0.5Pd/TiO <sub>2</sub>	6.93	4.30	1.29
5	TiO <sub>2</sub> sol-gel	4.67	2.44	2.00



**Fig. S3.** TGA of spent TiO<sub>2</sub> from the reaction with/without water co-fed.



**Fig. S4.** XRD of the spent catalysts under various conditions

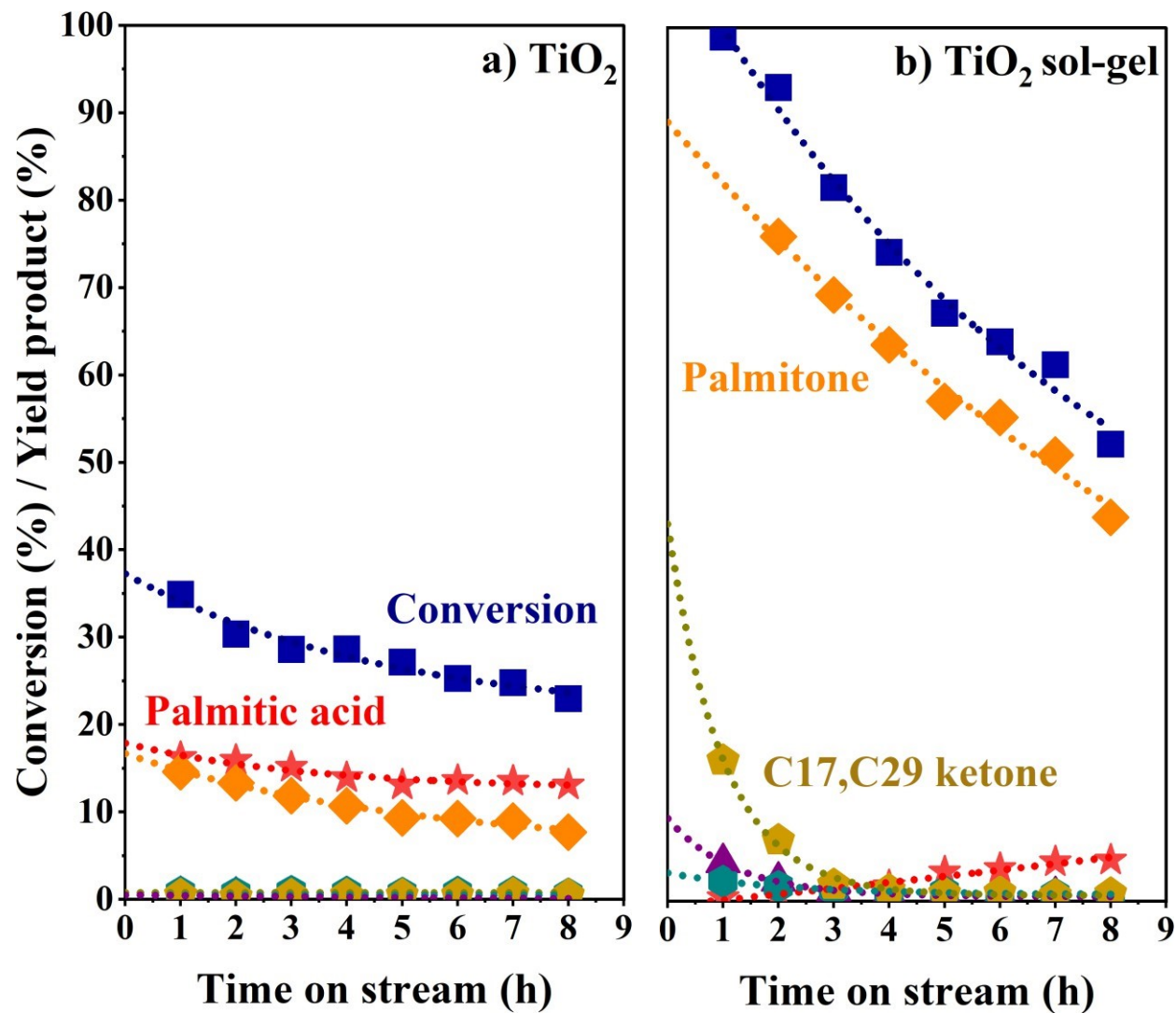


**Fig. S5.** Raman spectra of the fresh and spent TiO<sub>2</sub> (a) and 0.5Pd/TiO<sub>2</sub> (b).

**Table S1** Peak area and D/G band ratio from Raman spectra of the spent TiO<sub>2</sub> under H<sub>2</sub> and N<sub>2</sub> as carrier gas

Entry	Catalyst	Peak area		D/G
		D-band	G-band	
1	Spent TiO <sub>2</sub> under N <sub>2</sub>	148229	113545	1.3
2	Spent TiO <sub>2</sub> under H <sub>2</sub>	57735	76685	0.75

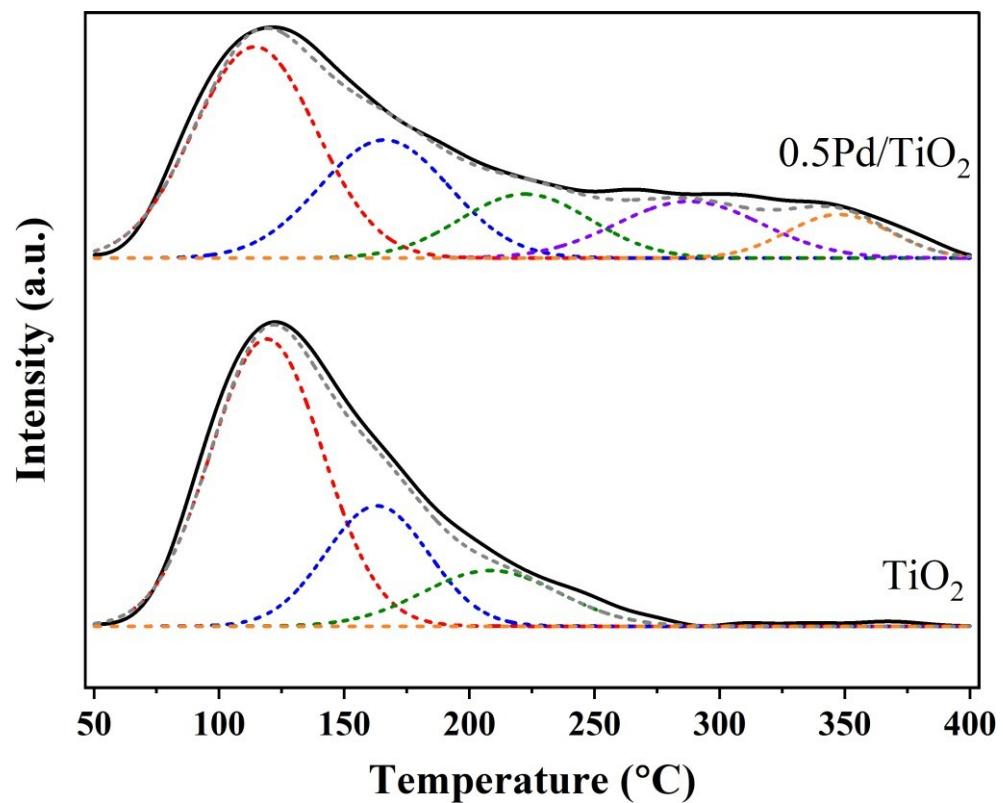
*Reaction condition 10%Methyl palmitate in dodecane : 3.1 ml/h, carrier gas flow rate : 50 ml/min, contact time : 581 gh/mol, activation temperature : 400 °C in air, reduction temperature : 400 °C under H<sub>2</sub>, reaction temperature : 400 °C, water : feed ratio 0.24*



**Fig. S6.** Time on stream profiles for ketonization of methyl palmitate over TiO<sub>2</sub> and TiO<sub>2</sub> sol-gel

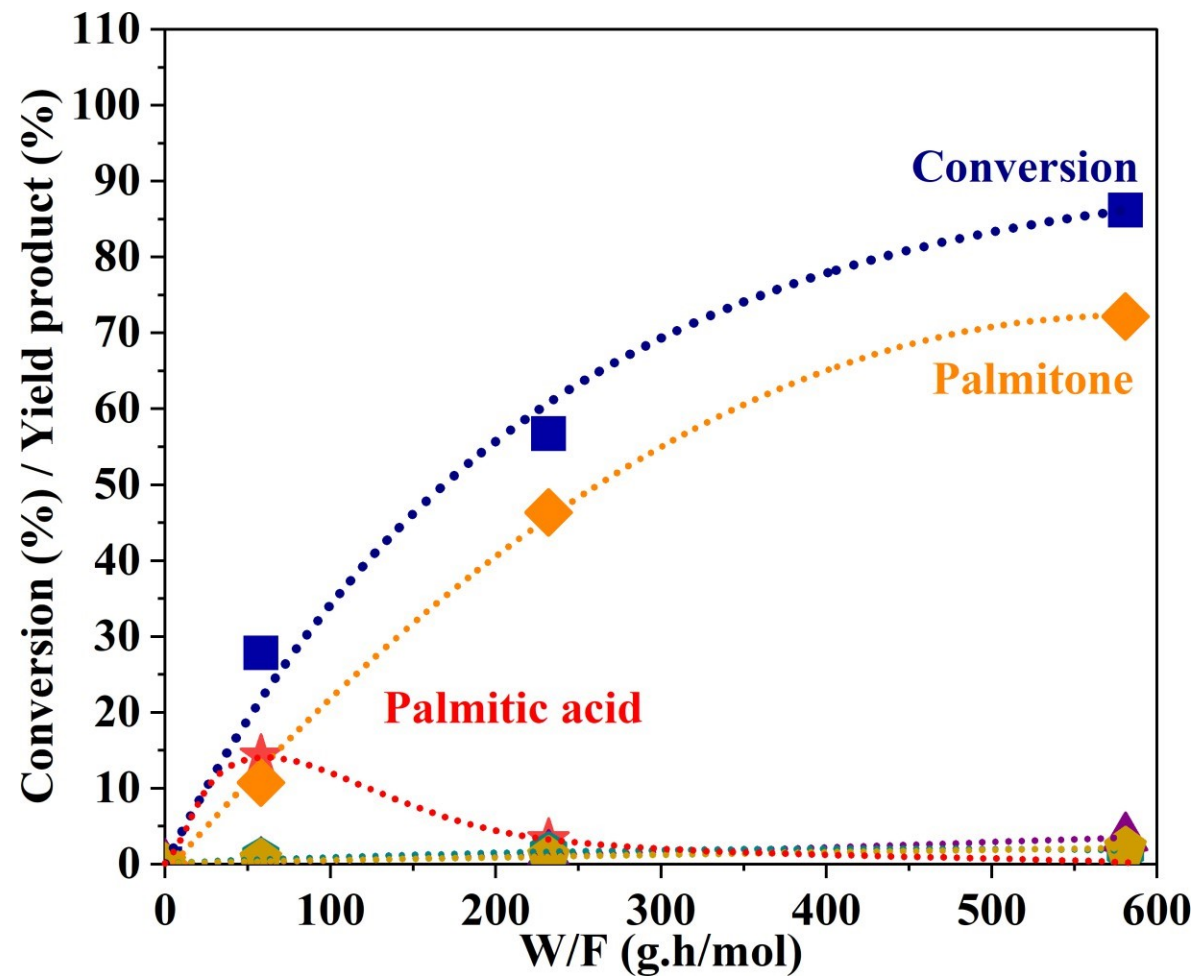
*Reaction condition 20% Methyl palmitate in dodecane : 3.1 ml/h, N<sub>2</sub> or H<sub>2</sub> flow rate : 50 ml/min, contact time : 58 gh/mol, activation temperature : 400 °C in air, reduction temperature : 400 °C under H<sub>2</sub>, reaction temperature : 400 °C, water : feed ratio 0.24*





Entry	Catalyst	Basicity ( $\mu\text{mol/g}$ )			Total
		Weak (<120 °C)	Medium (120-200 °C)	Strong (>200 °C)	
1	TiO <sub>2</sub>	2.92	1.20	0.47	4.6
2	0.5Pd/TiO <sub>2</sub>	2.39	1.41	2.05	5.9

**Fig. S7.** CO<sub>2</sub>-TPD profiles and basicity of reduced 0.5Pd/TiO<sub>2</sub> and TiO<sub>2</sub> catalysts



**Fig. S8.** Contact time profile for ketonization of methyl palmitate over  $\text{TiO}_2$  catalyst

*Reaction condition 10% Methyl palmitate in dodecane : 3.1 ml/h,  $\text{N}_2$  or  $\text{H}_2$  flow rate : 50 ml/min, contact time : 58-581 gh/mol, activation temperature : 400 °C in air, reduction temperature : 400 °C under  $\text{H}_2$ , reaction temperature : 400 °C, water : feed ratio 0.24*