

Supplementary Materials

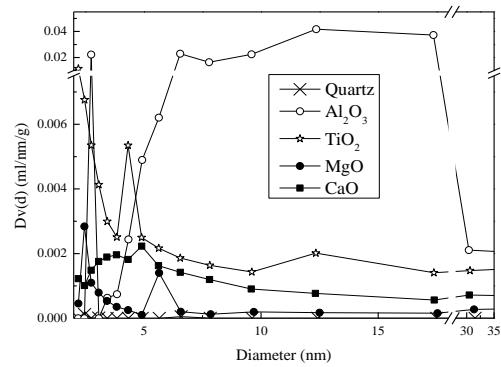


Figure S1: Pore size distributions of the studied catalysts

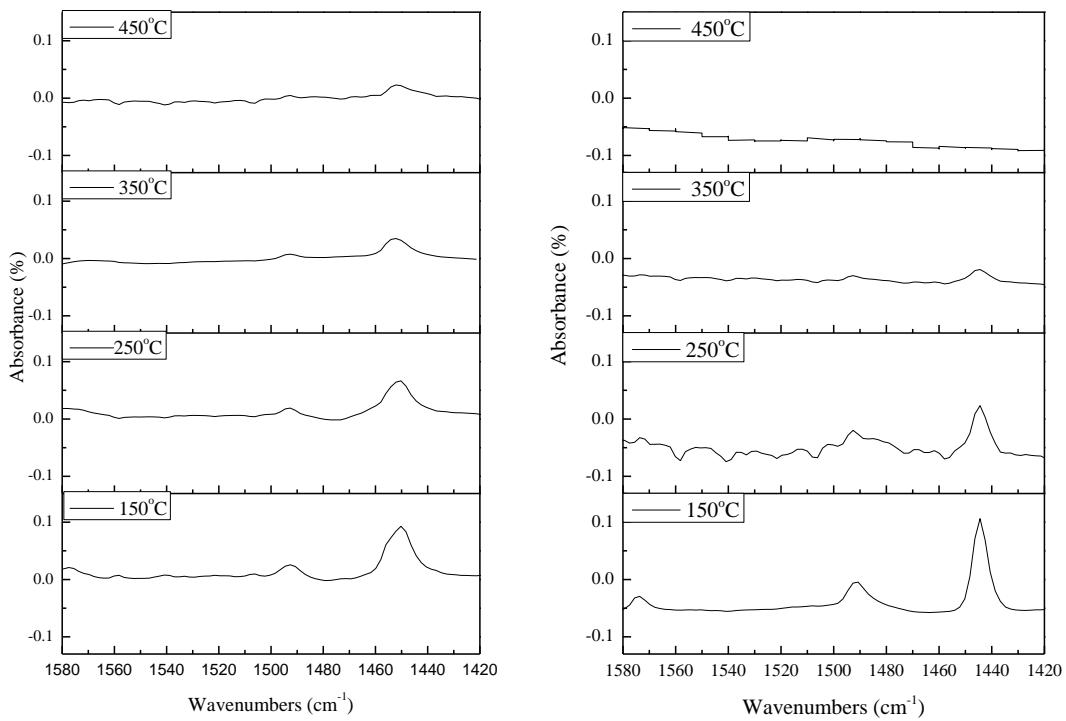


Figure S2: Py-FTIR spectra of the acidic catalysts

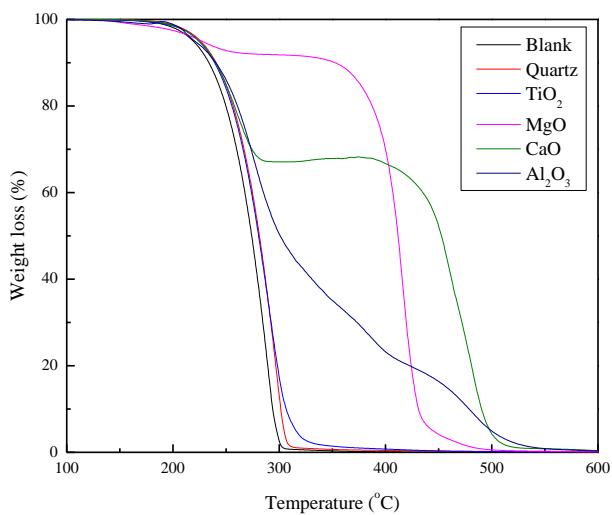
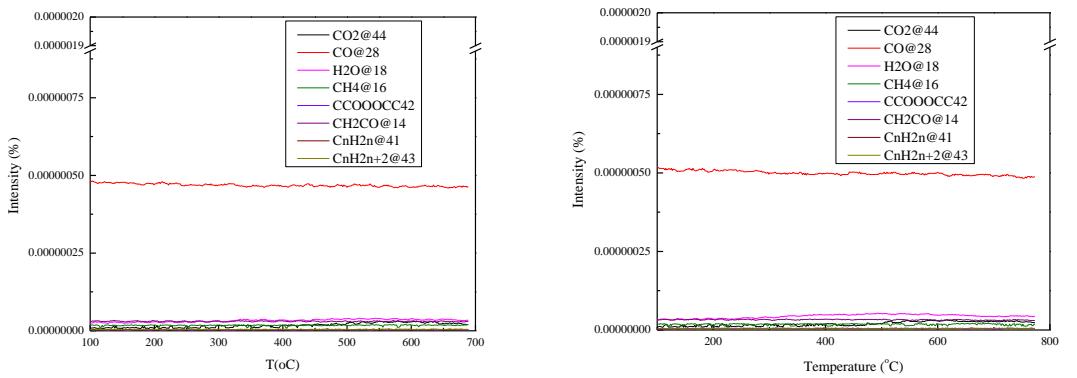
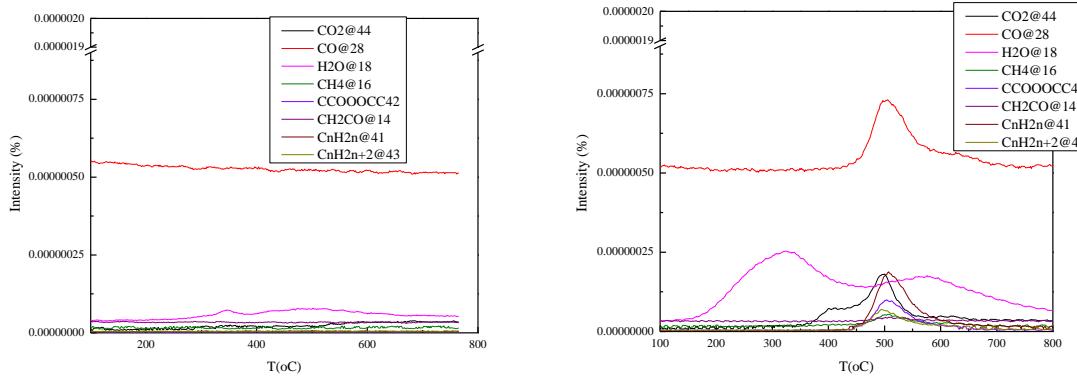


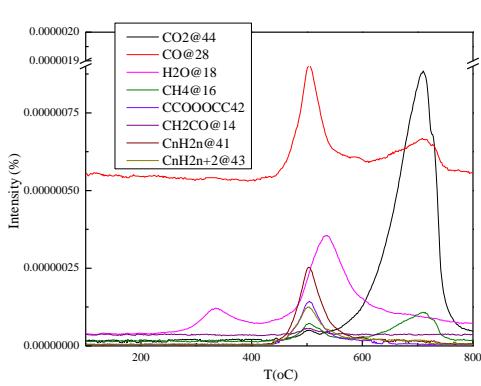
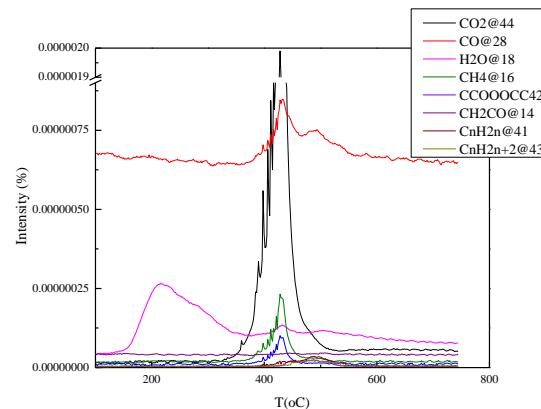
Figure S3: Oleic acid decomposition process with different catalysts by TGA



(a) blank

(b) quartz

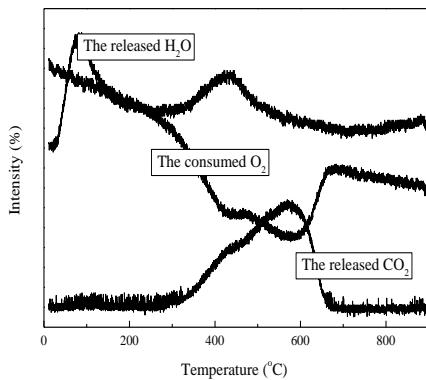
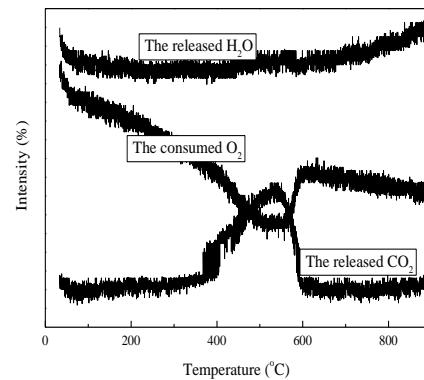


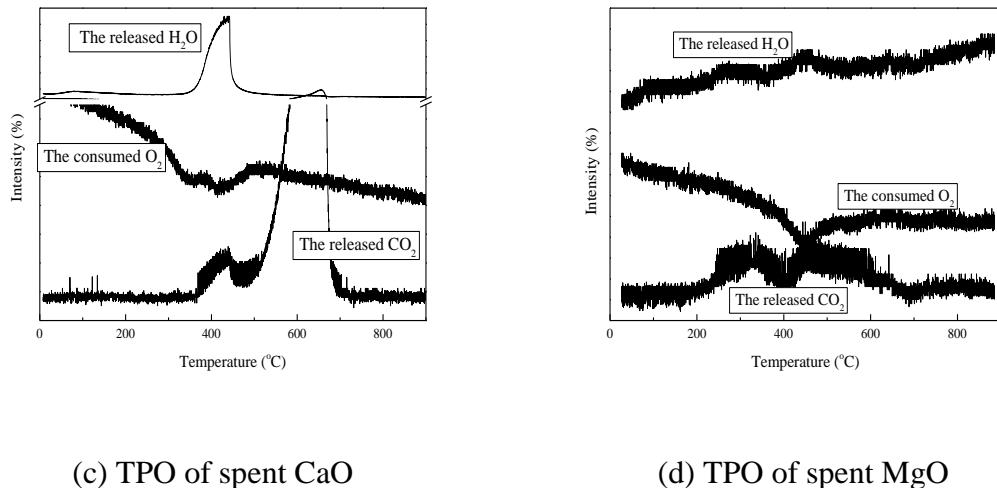
(c) TiO₂(d) Al₂O₃

(e) CaO

(f) MgO

Figure S4: the corresponding MS spectra of the Figure S3

(a) TPO of spent Al₂O₃(b) TPO of spent TiO₂



(c) TPO of spent CaO (d) TPO of spent MgO

Figure S5: TPO testing of the spent catalysts

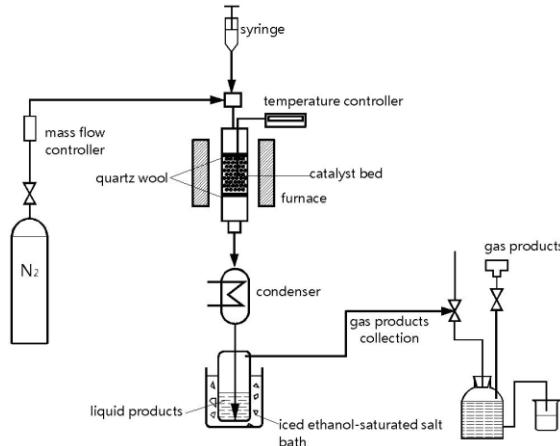


Figure S6: Reaction flow chart of this study

Table S1: Operational parameters of catalyst activity performance evaluation

Operational parameters	Values
Reaction temperature (°C)	470±1
Mass ratio of catalyst and quartz to feed	2.5±0.2 (TiO ₂ , 0.4)
Mass ratio of catalyst to quartz	1:2 (TiO ₂ , 1:17)
Mass of feed (g)	1.2±0.1
Injection time (s)	180±30 (TiO ₂ , 1140)

N ₂ flow rate (ml/min)	30				
Concentration (%)	Quartz	Al ₂ O ₃	TiO ₂	CaO	MgO
CH ₄	0.15	0.46	0.37	1.15	0.27
C ₂ H ₄	0.27	0.48	0.36	0.49	0.38
C ₂ H ₆	0.15	0.50	0.36	0.86	0.27
C ₃ H ₆	0.20	0.61	0.33	0.45	0.31
C ₃ H ₈	0.08	0.44	0.20	0.56	0.14
C ₄ H ₈	0.10	0.21	0.16	0.24	0.17
C ₄ H ₁₀	0.03	0.19	0.09	0.37	0.07
C ₅ H ₁₀	0.07	0.25	0.12	0.20	0.12
C ₅ H ₁₂	0.06	0.05	0.10	0.32	0.13
C ₆ H ₁₂	0.06	0.06	0.18	0.11	0.18
C ₆ H ₁₄	0.03	0.11	0.11	0.17	0.13
C=	0.70	1.61	1.15	1.49	1.16
C	0.50	1.75	1.23	3.43	1.01
H ₂	0.16	0.81	1.86	2.23	0.10

Table S2: Organic gas products compositions