Electronic supplementary information for

Selective hydroconversion of coconut oil-derived lauric acid to alcohol and aliphatic alkanes over MoO_x-modified Ru catalysts under mild conditions

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The physico-chemical properties such as specific surface area BET (S_{BET}), average Ru particle sizes, total acidity, and H_2 uptake of Ru-MoO_x/TiO_2 are summarized in **Table S1**.

Table S1 Physico-chemical properties of Ru-MoO_x/TiO_2 catalyst

Entry	Catalyst	Mo loading amount (mmol g^{-1})	S_{BET}[a] (m^2/g)	V_{pore}[a] (cm^3/g)	D[b] (nm)	Total Acid[c] (μmol NH_3/g)
1	Ru–(0.011)MoO_x/TiO_2	0.011	23.7	0.035	nd	223
2[d]	Ru–(0.026)MoO_x/TiO_2	0026	20.8	0.029	3.48	199
3	Ru–(0.049)MoO_x/TiO_2	0.049	21.3	0.033	nd	201
4	Ru–MoO_x/TiO_2	0.026	19.8	0.031	3.48	298
5	Ru–MoO_x/TiO_2 [recovered]	0.026	20.4	0.034	n.a.	n.a

[e]S_{BET} is specific surface areas, determined by N_2 physisorption at 77 K using BET method. [b]Average particle sizes of Ru derived from TEM images. [c]Acidity was derived from NH_3-TPD spectra. [d]Recovered catalyst after the second reaction of lauric acid hydroconversion.

The XRD analysis of H_2-activated Ru–(0.026)MoO_x/TiO_2 at 400°C and 500°C (Fig. S1) unable to detect the formations of metallic Ru or bimetallic Ru-MoO_x phase due to its extremely very small the Ru particle sizes.

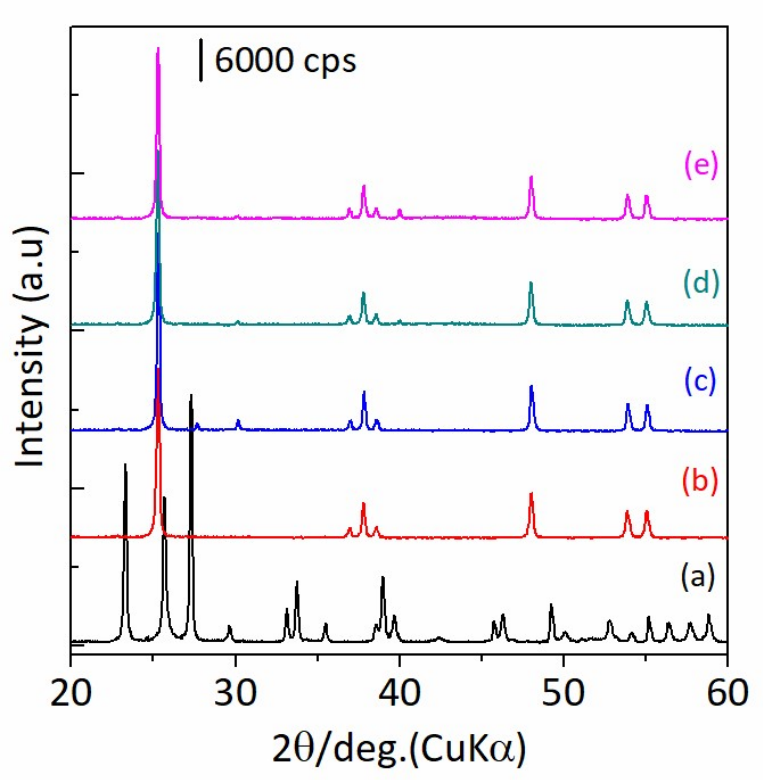

Fig. S1 XRD patterns of (a) 5wt%Ru@MoO_3, (b) 5wt%Ru/TiO_2, and Ru–(y)MoO_x/TiO_2 with different Mo loading amount of (c) 0.011 mmol g^{-1}, (d) 0.026 mmol g^{-1}, and (e) 0.049 mmol g^{-1} after reduction with H_2 at 400°C for 3 h.

A typical TEM images of H_2-reduced Ru–(0.026)MoO_x/TiO_2 at 400°C for 1.5 h showed the dispersed both Ru and Mo species on surface of TiO_2 and the estimated particle sizes of metallic Ru were around 3.48 nm as indicated in Fig. S2.

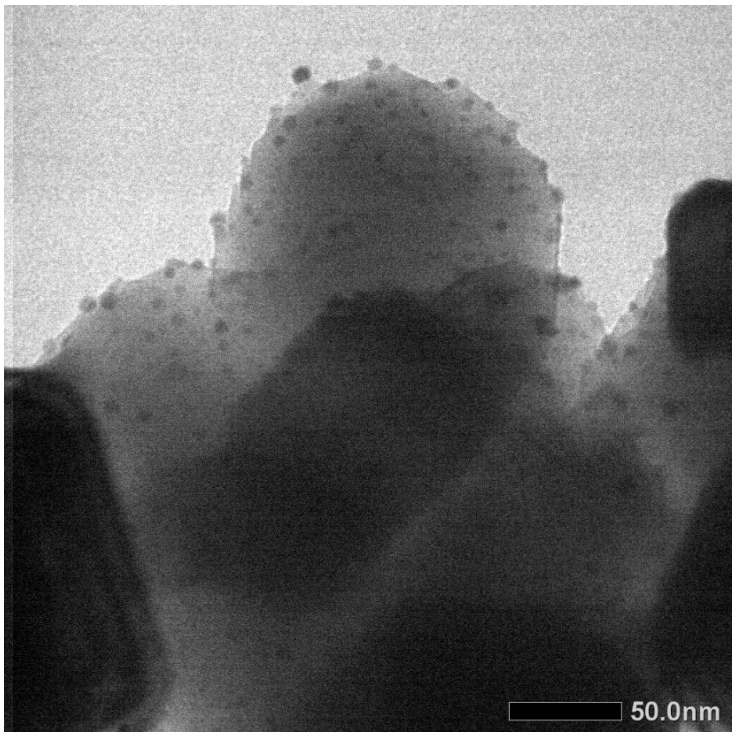

Fig. S2 Typical TEM images of Ru–(0.026)MoO_x/TiO_2 catalyst after reduction with H_2 at 400°C for 3 h.

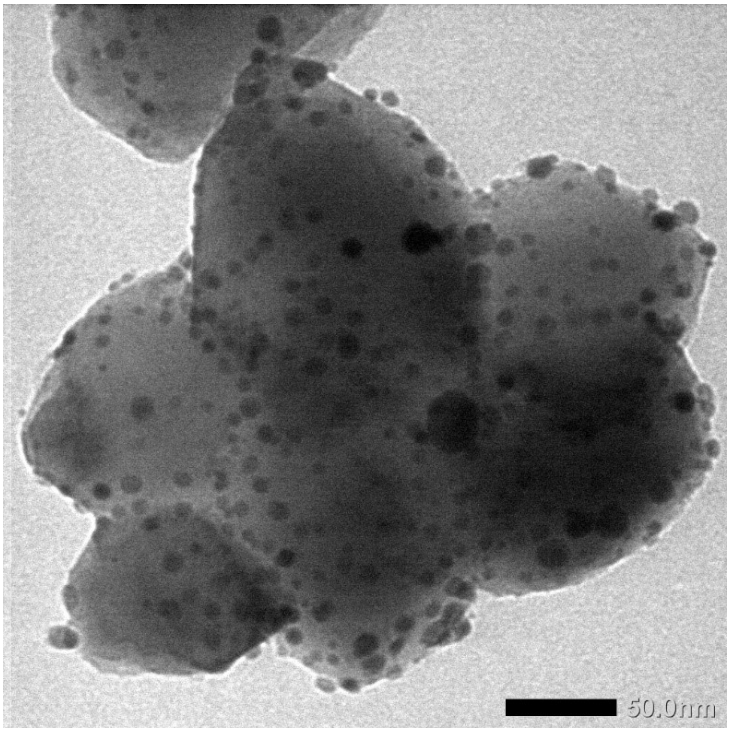

Fig. S3 Typical TEM images of Ru–(0.049)MoO_x/TiO_2 catalyst after reduction with H_2 at 400°C for 3 h.

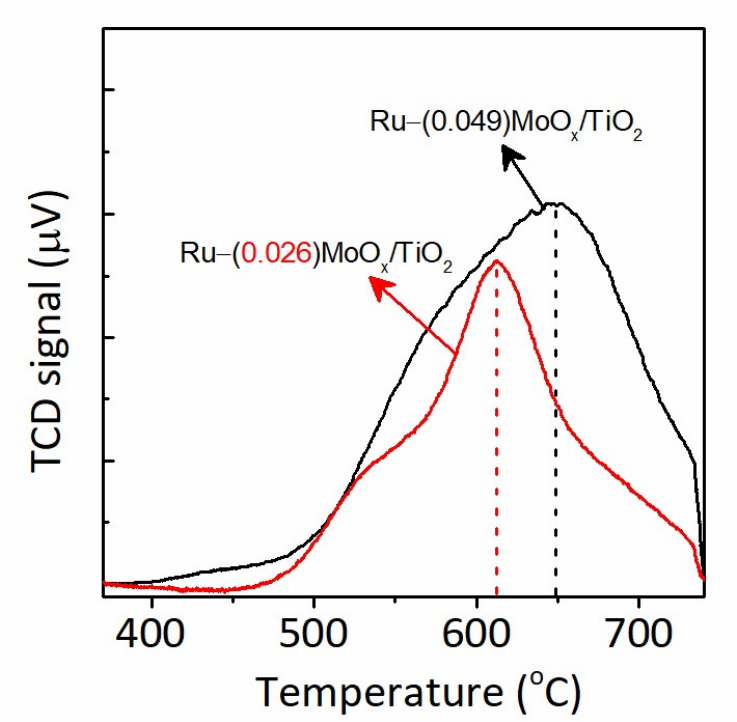

Fig. S4 NH_3-TPD profiles of Ru-MoOx/TiO_2 with different Mo loading amount of 0.026 mmol g^{-1} and 0.049 mmol g^{-1} catalysts after reduction with H_2 at 400°C for 3 h.

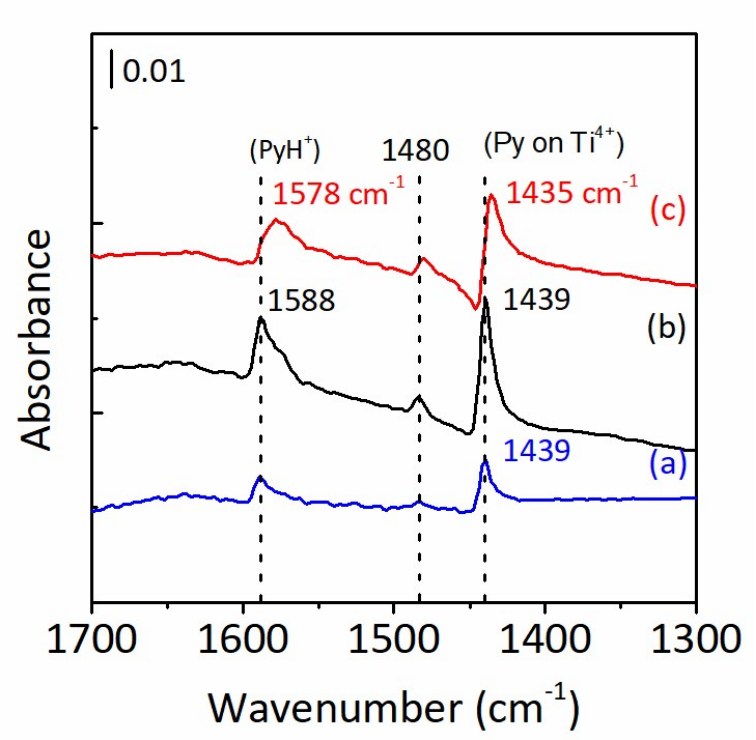

Fig. S5 Pyridine adsorption profiles of (a) 5wt%Ru/TiO_2, (b) Ru–(0.026)MoOx/TiO_2, (c) Ru–(0.049)MoOx/TiO_2 catalysts after reduction with H_2 at 400°C for 3 h.

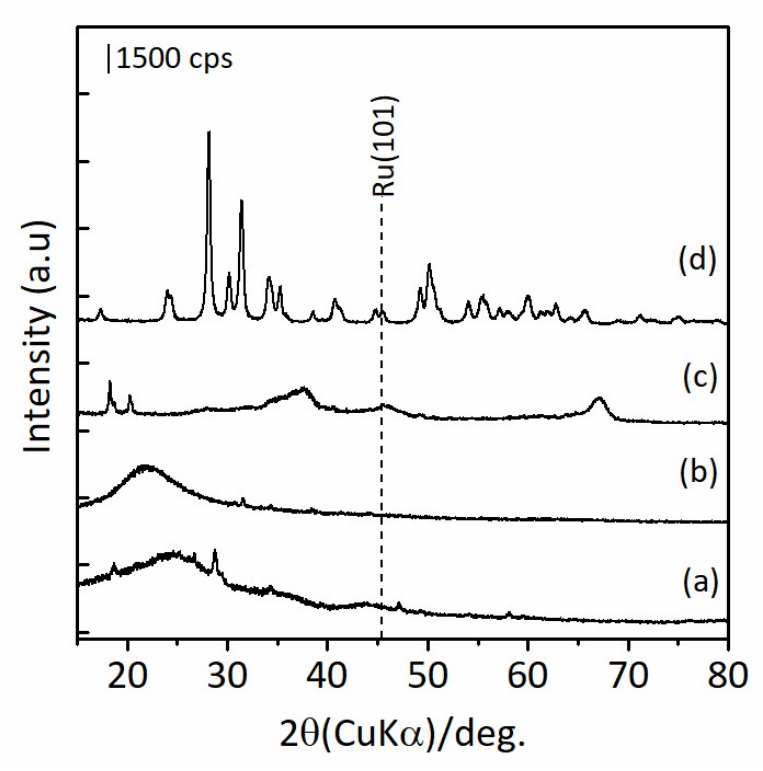

Fig. S6 XRD patterns of Ru–MoO_x supported on (a) SiO_2, (b) charcoal (active carbon), (c) γ–Al_2O_3, and (d) ZrO_2 catalysts after reduction with H_2 at 400°C for 3 h.

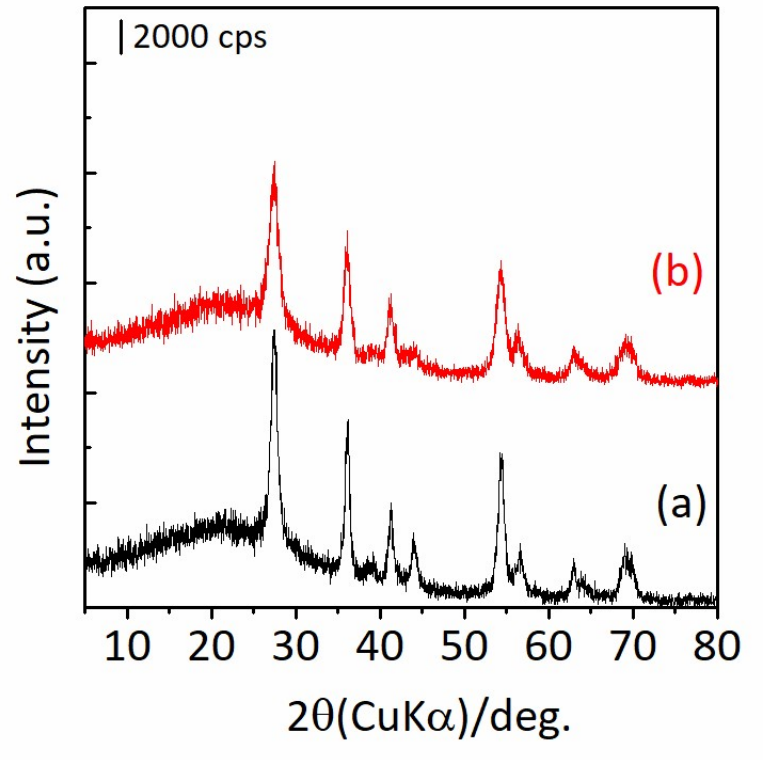

Fig. S7 XRD patterns of Ru–MoO_x/C-TiO_2 (a) as-prepared and (b) after reduction with H_2 at 400°C for 3 h.

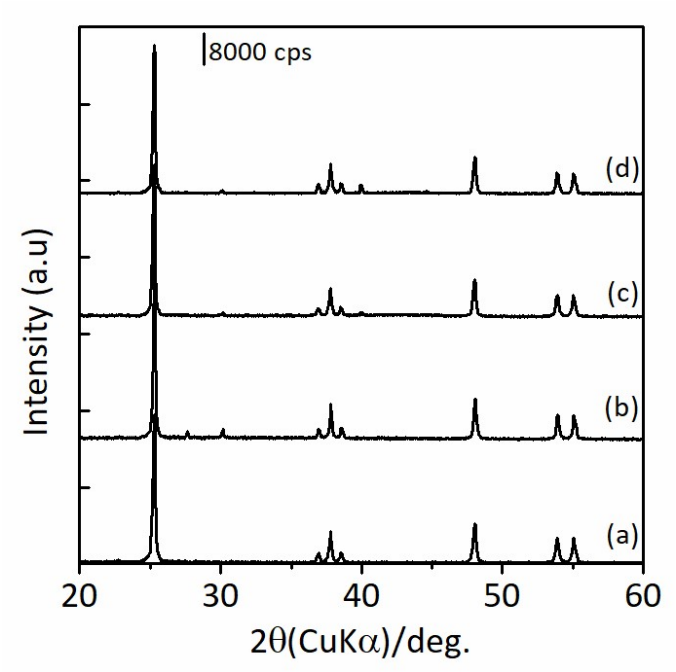

Fig. S8 XRD patterns of (a) Ru(5wt%)/TiO_2 anatase and Ru–(0.026)MoO_x/TiO_2 after reduction with H_2 at different temperature of (b) 400°C, (c) 500°C and (d) 600°C for 3 h.

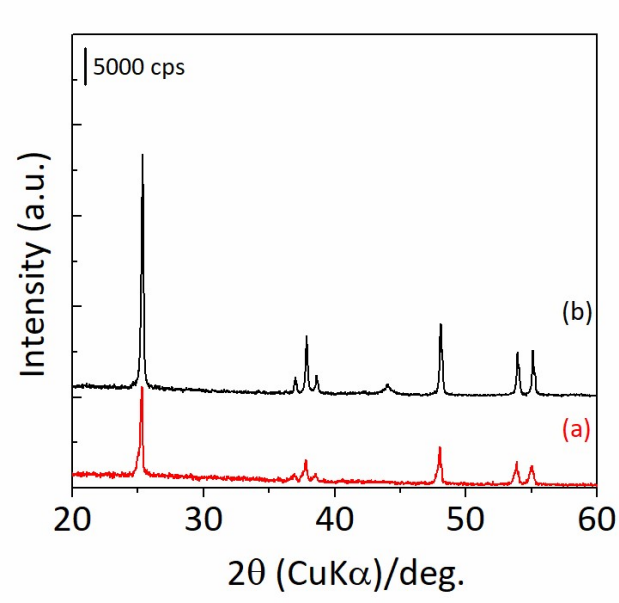

Fig. S9 XRD patterns of recovered Ru–(0.026)MoO_x/TiO_2 (500°C/H_2) catalyst after the 2nd recylced reaction run.

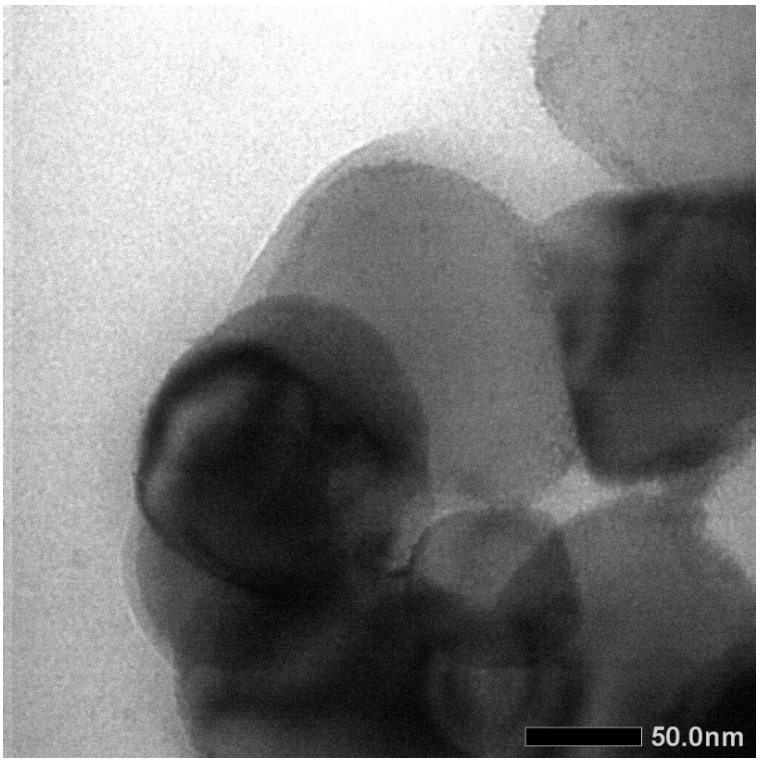

Fig. S10 Typical TEM images of recovered Ru–(0.026)MoO_x/TiO_2 (500°C/H_2) catalyst after the 2nd recylced reaction run.

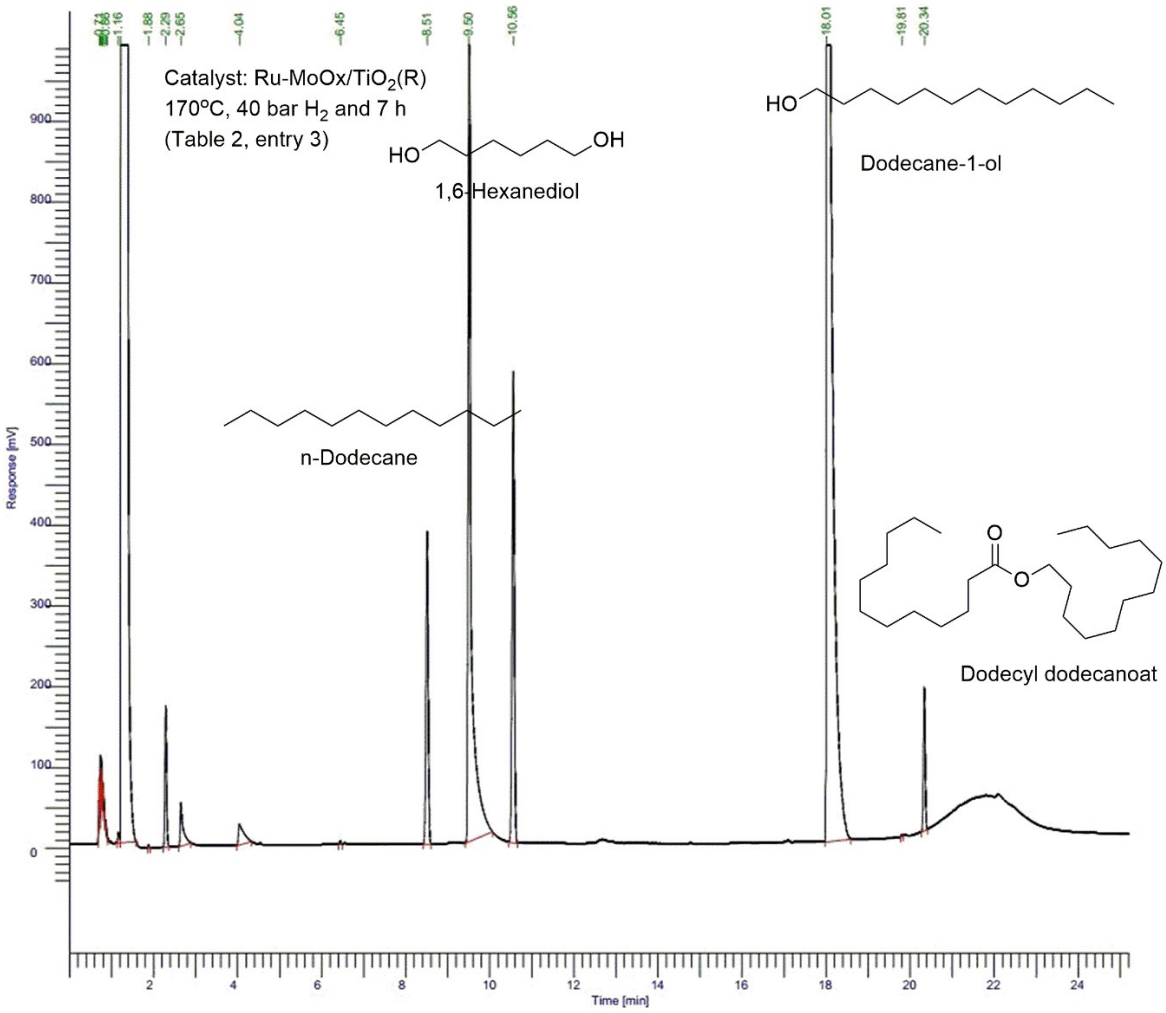

Fig. S11 Typical GC chart of reaction results of hydroconversion of lauric acid to lauryl alcohol and alkane using Ru–MoO_x/TiO_2 (R) catalyst (Table 2. Entry 3).

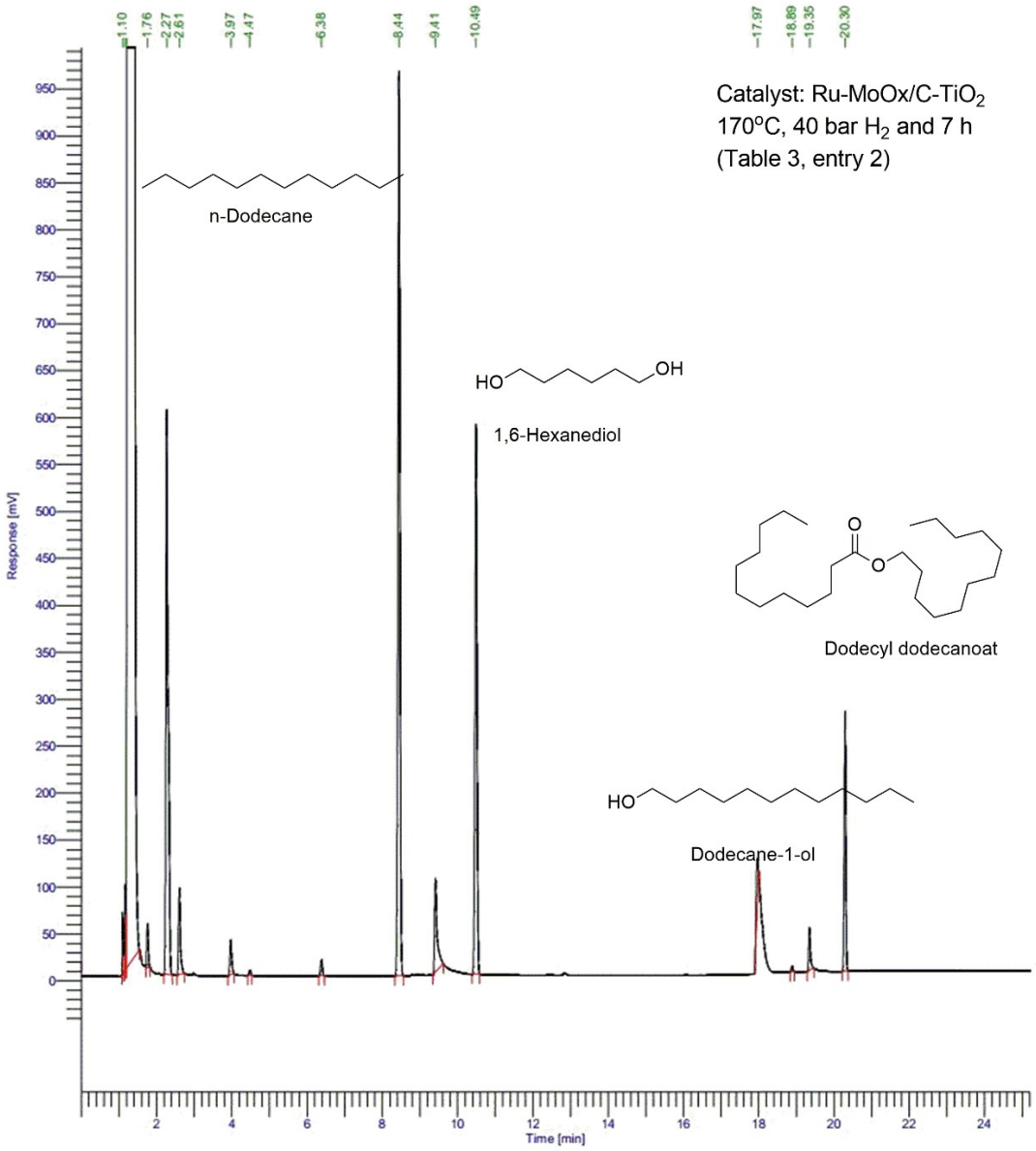

Fig. S12 Typical GC chart of reaction results of hydroconversion of lauric acid to lauryl alcohol and alkane using Ru-MoO_x/C-TiO2 catalyst (Table 3, entry 2).

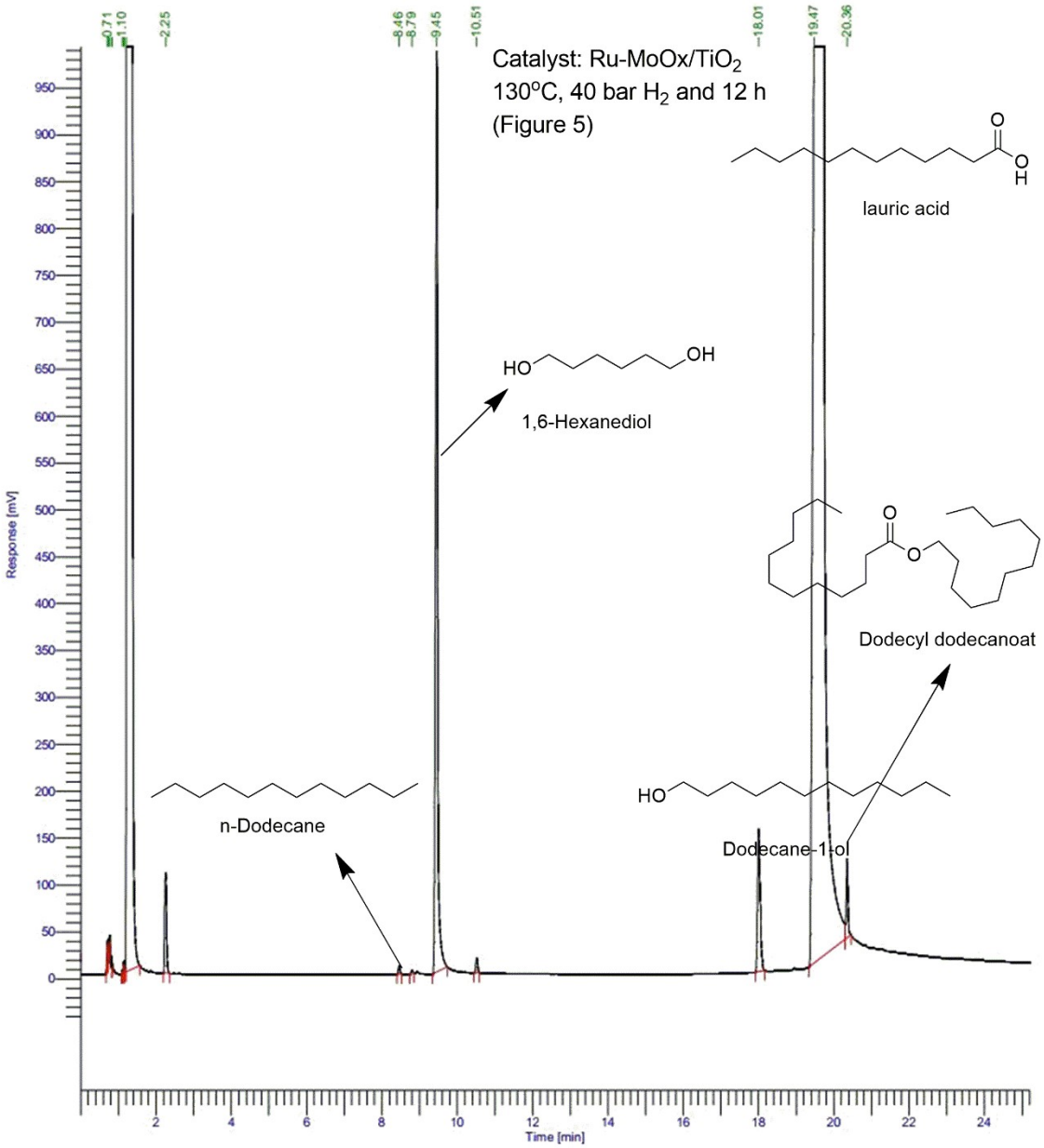

Fig. S13 Typical GC chart of reaction results of hydroconversion of lauric acid to lauryl alcohol and alkane using Ru-MoO_x/TiO_2 catalyst (Figure 5, 130°C, 40 bar, 12 h). Conversion (58%), Yield of dodecane-1-ol (20.2%), yield of n-dodecane (2%), and yield of dodecyldodecanoate (35.7%).