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Electronic Supplementary Information (ESI)

Tailored synthesis of CoO_x thin films for catalytic application

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Table S1 Experimental conditions

Precursor	$Co(acac)_2$
Solvent	Ethanol
Concentration	2.5 mM
Substrates	Planar glass, stainless steel, mesh of stainless steel
Frequency and opening time	4 Hz, 1.2 ms
Evaporation temperature	220 ℃
Substrate temperature	350, 400 and 450 ℃
System pressure	3.0 kPa
N_2	0.25 SLM
O_2	0.75 SLM

Note: SLM refers to standard liter per minute.

With every sample mesh, the catalytic test was performed three times. As shown in Fig. S1, a good reproducibility was observed for all the prepared samples.

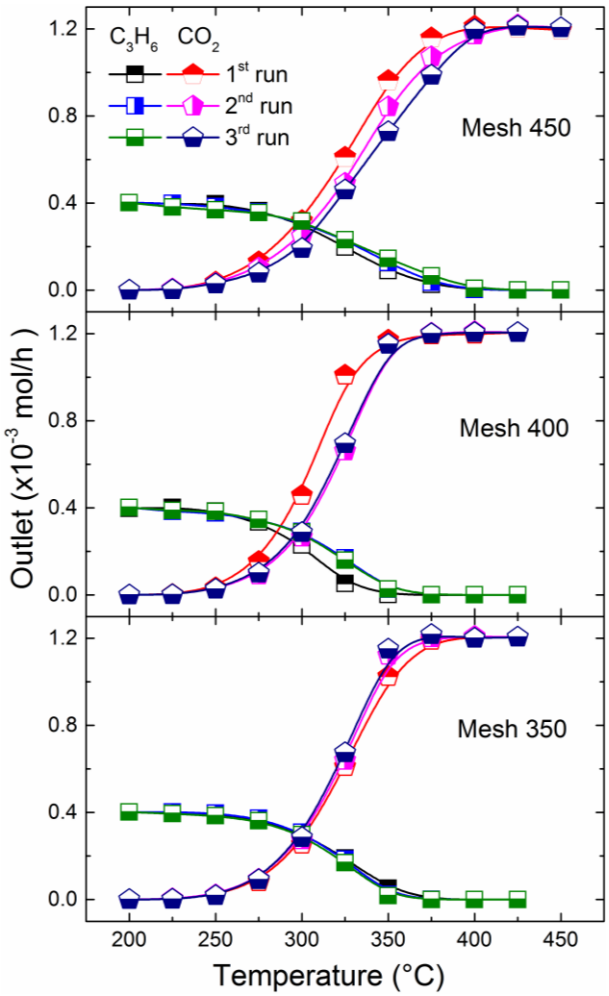

Fig. S1 Repeated catalytic tests of C_3H_6 with coated meshes prepared at 350, 400 and 450 ℃.

Figure S2 presents the similar results obtained from the blank system and over NCM during the oxidation process of C_3H_6. The results indicate that NCM is an inert carrier and has negligible effects on the evaluation of the catalytic activity of the deposited TMOs.

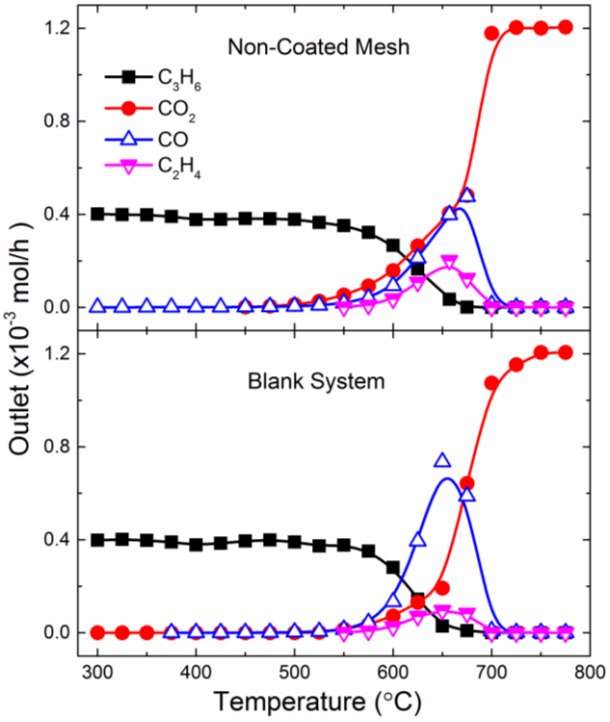

Fig. S2 Outlet profiles of C_3H_6 oxidation over NCM and in a blank system.

Figure S3 displays a standard IR spectrum for C_3H_6 with a homemade gas chamber. 575 cm^{-1}, 913 cm^{-1}, 990 cm^{-1}, 2953 cm^{-1} and 3103 cm^{-1} are the characteristic absorption peaks of C_3H_6.

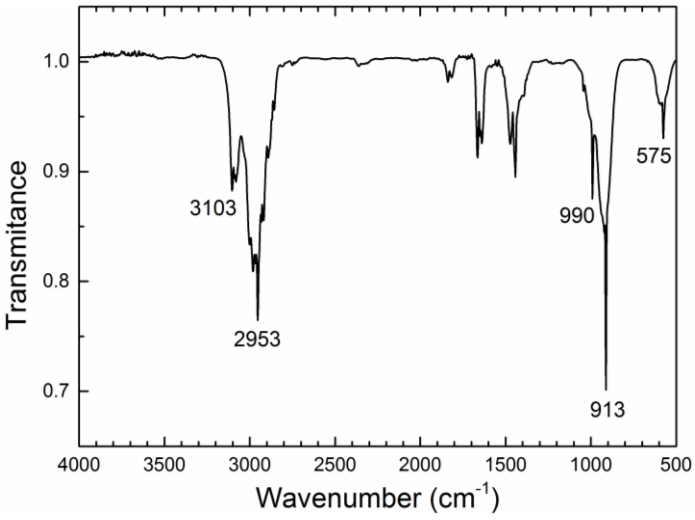

Fig. S3 FTIR transmitance spectrum of C_3H_6 obtained by a self-designed infrared gas pool.

The DRIFTS spectra of CoO_x prepared at 350 and 450 ℃ were showed in Fig. S4 and S5, respectively. As the temperature increases, the signal of propene (913 cm^{-1}) gets weaker and the signal of CO_2 becomes stronger. In Fig. S4 and S5, redshift of CoO and Co_3O_4 peaks can be observed as temperature increased, this shows the increasing activity of the catalyst, moreover, the random changes of the relative intensity of peaks assigned to CoO and Co_3O_4 consistent with a sustainable redox process.

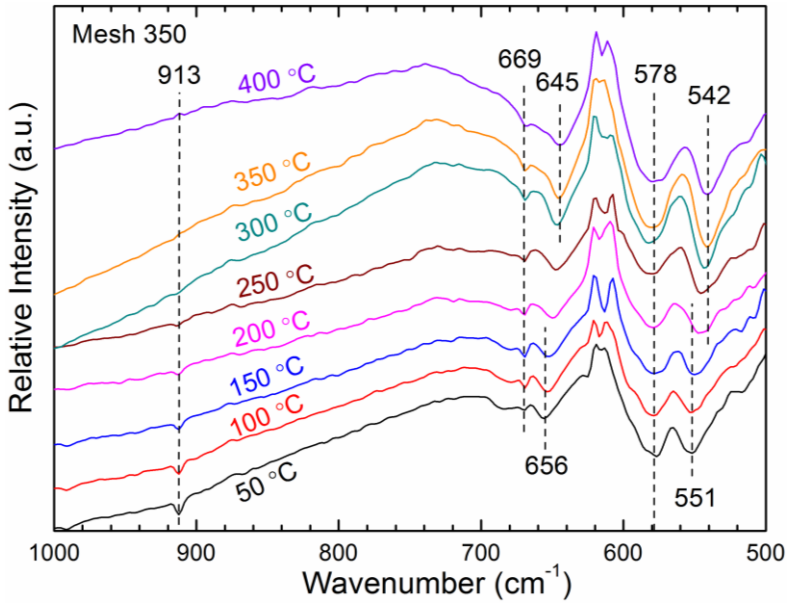

Fig. S4 In situ DRIFTS spectra of CoO prepared at 350 ℃ during C_3H_6 adsorption at different temperatures.

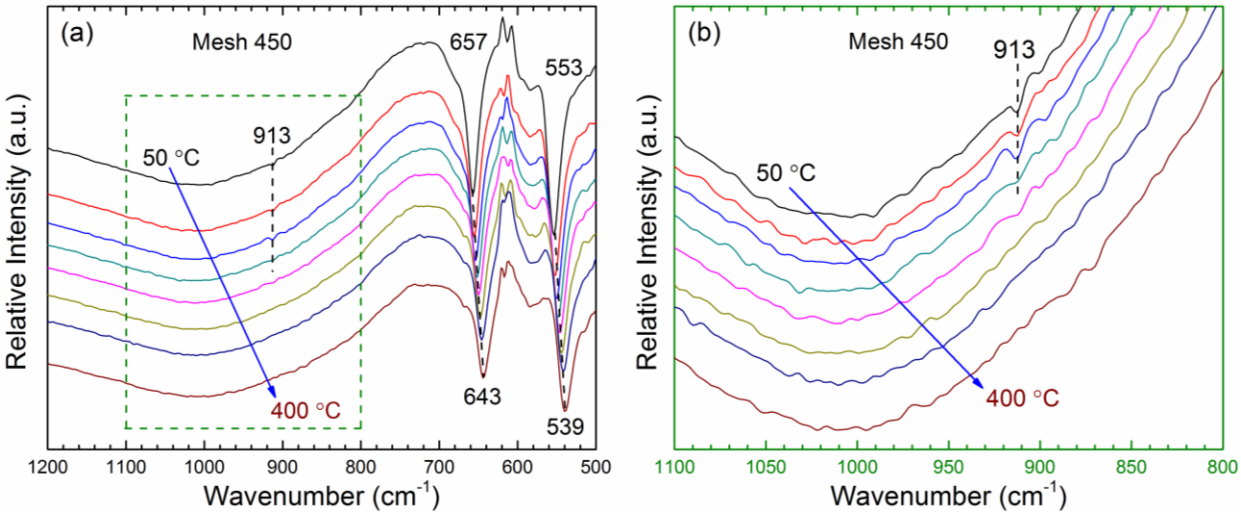

Fig. S5 In situ DRIFTS spectra of Co_3O_4 prepared at 450 ℃ during C_3H_6 adsorption at different temperatures.