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Electronic Supplementary Information (ESI)

CVD synthesis of Cu_2O films for catalytic combustion of VOCs

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Table S1: Experimental conditions for the deposition of Cu_2O

Precursor	$Cu(acac)_2$
Solvent	Ethanol
Concentration of precursor	2.5 mM
Frequency	4 Hz
Opening time	2.5 ms
Feeding rate	1.03 mL/min
Evaporation temperature	180 ℃
Substrate temperature	270 ℃
System pressure (kPa)	3.0
N_2 (SLM)	0.5
O_2 (SLM)	1.0
Substrates	Glass, planar or mesh of stainless steel

Table S2: Chemical composition of Cu_2O thin films

Non–etched sample		
Element	Peak BE	Proportion (%)
C 1s	284.78	17.11
O 1s	529.87	43.73
Cu 2p	933.62	39.16
5.7 nm–etched sample		
Element	Peak BE	Proportion (%)
C 1s	284.80	6.12
O 1s	529.61	41.99
Cu 2p	932.35	51.89
95 nm–etched sample		
Element	Peak BE	Proportion (%)
C 1s	284.78	1.54
O 1s	530.14	35.62
Cu 2p	932.37	62.84

Note: The subscripts 1s and 2p refer to electron orbits of XPS.

High-resolution entire XPS spectra of Cu_2O films with different etching depth are shown in Fig. S1. The most obvious peaks come from the presence of copper element consisting of Cu $2p_{3/2}$ and Cu $2p_{1/2}$. The Cu:O ratio falls down from the surface to the bulk due to the gradual decrease of the absorbed oxygen. Moreover, the carbon component declines from surface to the bulk after 95 nm etching. Hence, it can be inferred that the carbon mainly comes from ambient air and the carbon contamination products is negligible inside the Cu_2O films.

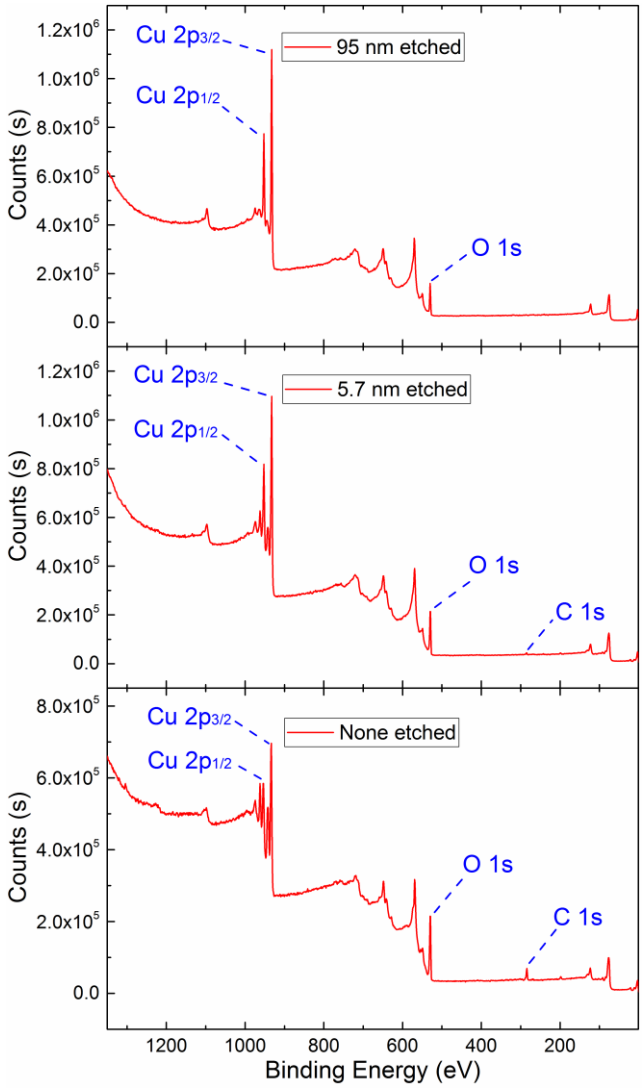

Fig. S1 Entire XPS spectra of Cu_2O films with different etching depth.

Cu 2p spectra of Cu_2O films with different etching depth are shown in Fig. S2. Compared to the standard spectra of both CuO and Cu_2O, it can be easily found that the Cu_2O component becomes deominant in the interior of the films deposited referring to the surface. This phenomenon mainly comes from the contaminations on the surface.

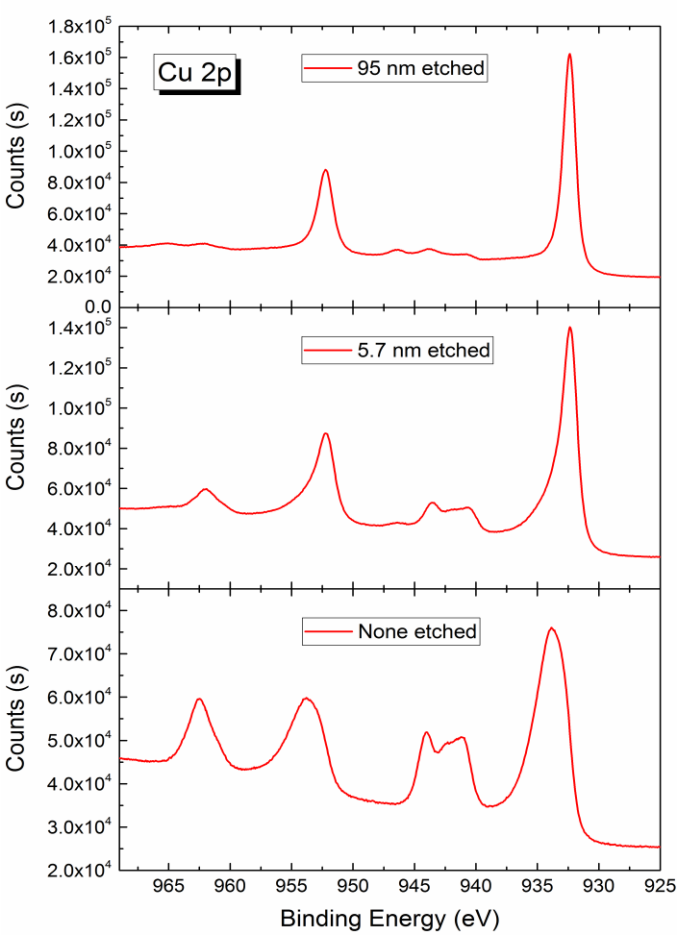

Fig. S2 Cu 2p spectra of Cu_2O films with different etching depth.

Figure S3 provides the O 1s and C 1s spectra of Cu_2O with different etching depth. With the same variation tendency, both the oxygen and carbon component decrease from the surface to the bulk.

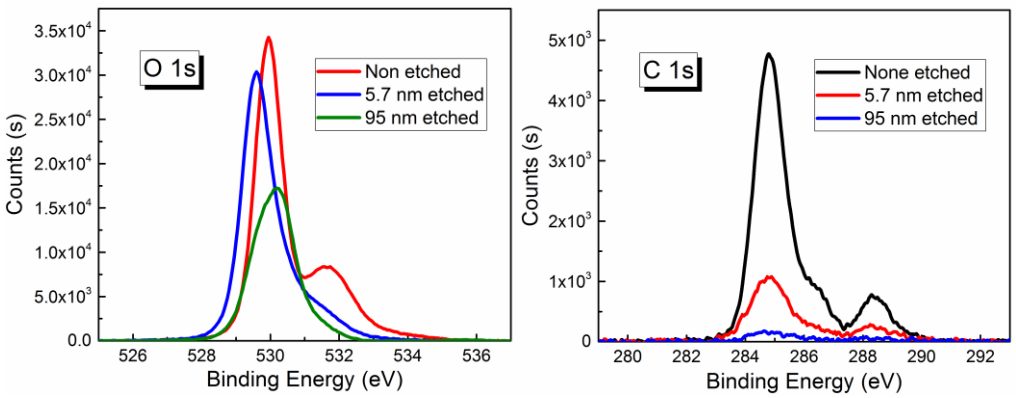

Fig. S3 O 1s and C 1s spectra of Cu_2O surfaces with different etching depth.

Figure S4 presents the releases of CO_2 and CO in the oxidation processes on both Cu_2O-coated mesh and non-coated mesh. The maximum temperatures of CO_2 release in the oxidation processes of C_2H_2 and C_3H_6 agree well with the complete oxidation of C_2H_2 and C_3H_6.

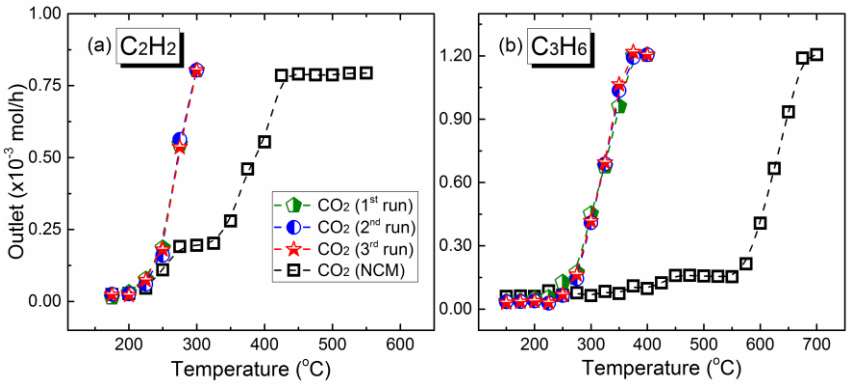

Fig. S4 Outlet profiles of CO and CO_2 during the catalytic tests.