

Supplementary Information

Aerobic oxidation of fluorene to fluorenone over Co-Cu bimetal oxides

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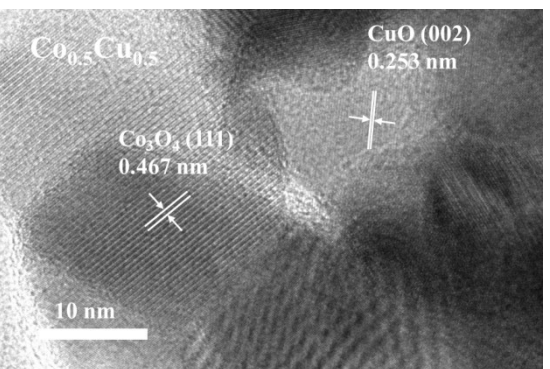
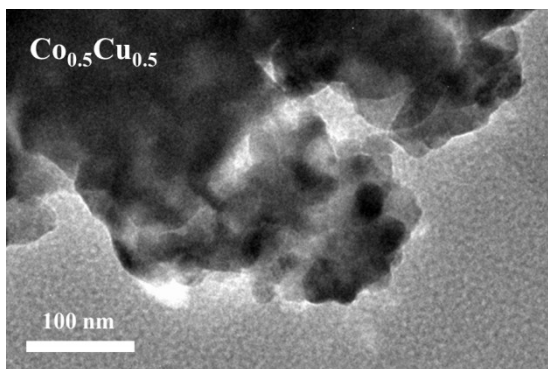
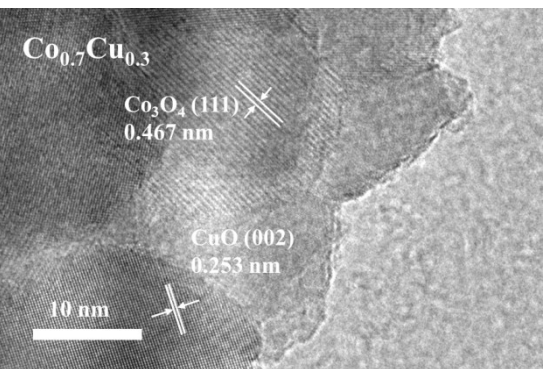
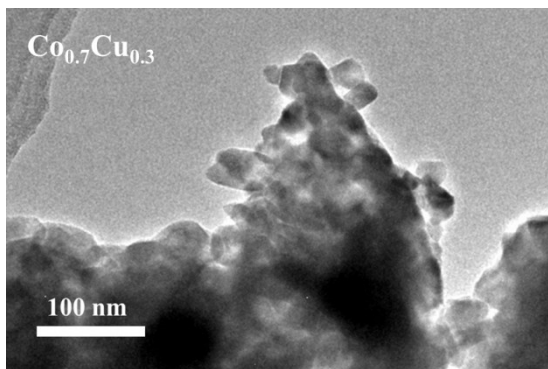
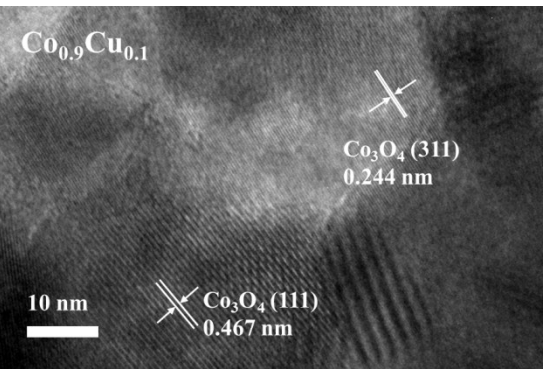
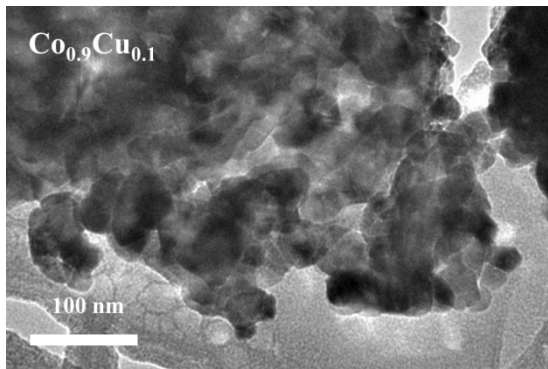
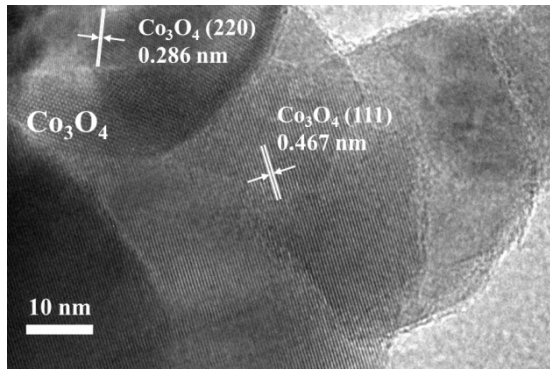
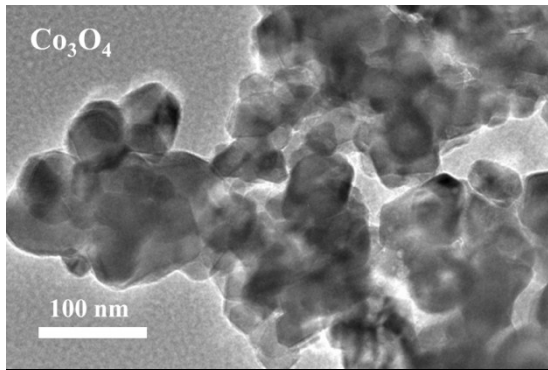
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Table S1 The ICP results of $\text{Co}_{1-x}\text{Cu}_x$

Sample	Co (wt%)	Cu (wt%)	Cu/(Co+Cu) molar ratio	Cu/(Co+Cu) feed molar ratio
$\text{Co}_{0.9}\text{Cu}_{0.1}$	79.70	9.65	0.101	0.1
$\text{Co}_{0.7}\text{Cu}_{0.3}$	57.83	26.79	0.301	0.3
$\text{Co}_{0.5}\text{Cu}_{0.5}$	43.14	45.90	0.497	0.5
$\text{Co}_{0.3}\text{Cu}_{0.7}$	24.20	62.14	0.704	0.7



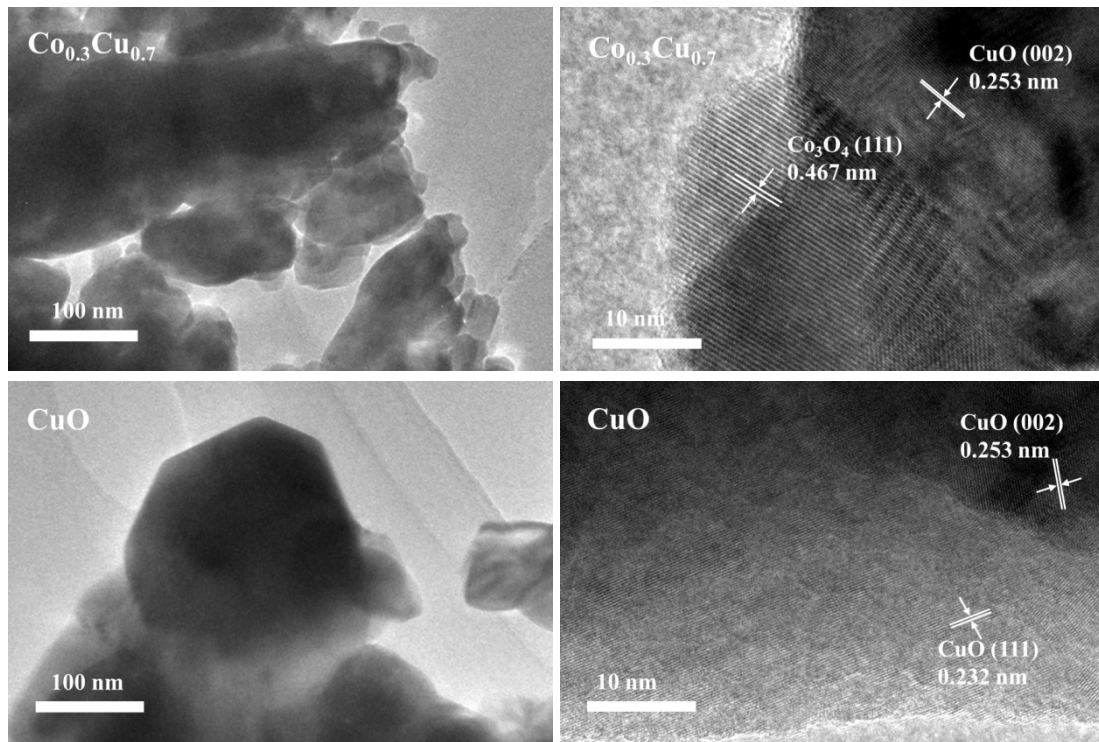


Fig. S1 TEM and HRTEM images of $\text{Co}_{1-x}\text{Cu}_x$

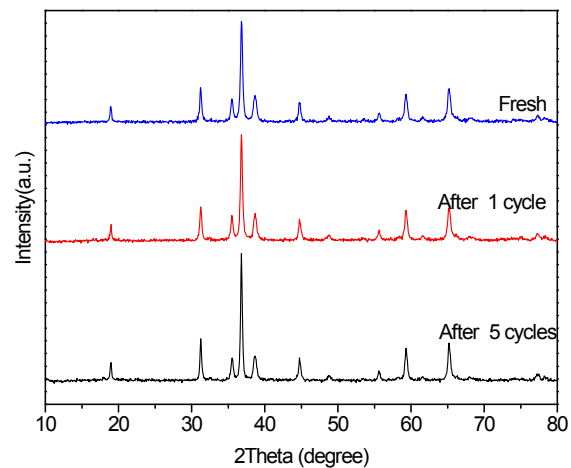


Fig. S2 XRD profiles of $\text{Co}_{0.7}\text{Cu}_{0.3}$ catalyst before and after reaction

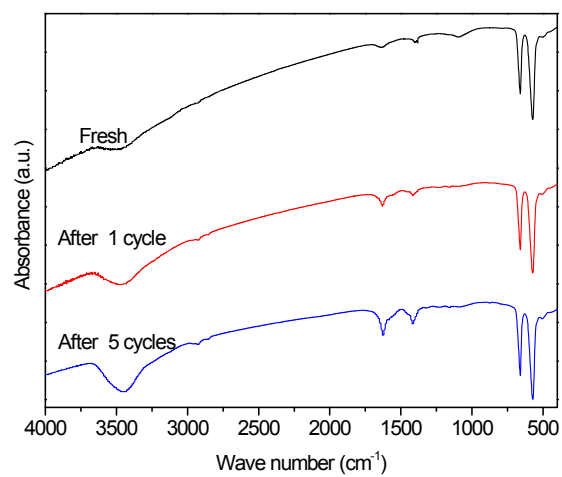


Fig. S3 FT-IR spectra of $\text{Co}_{0.7}\text{Cu}_{0.3}$ catalyst before and after reaction

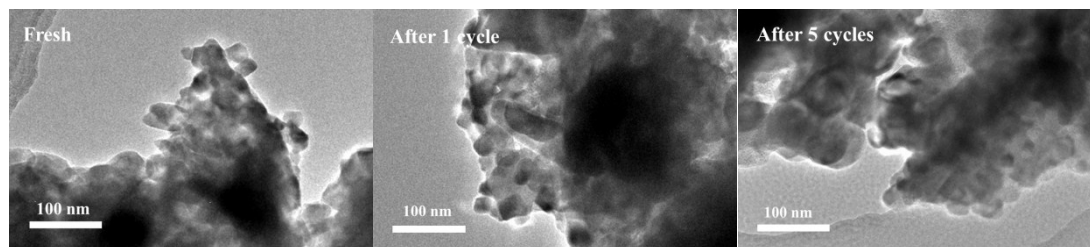
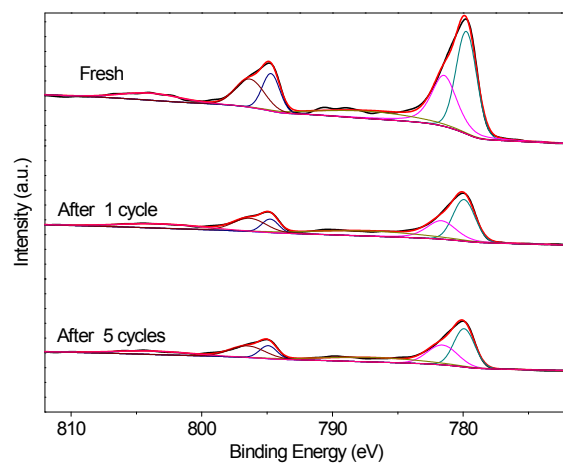
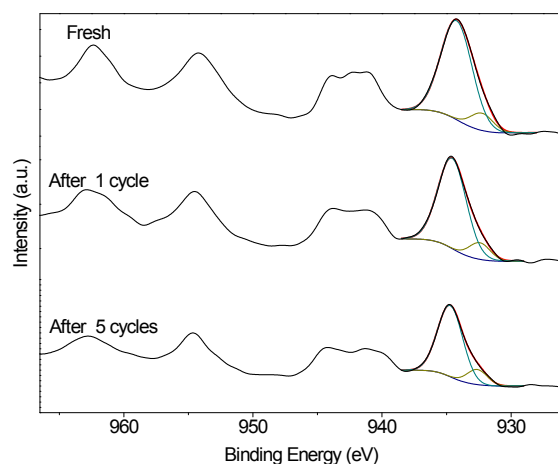


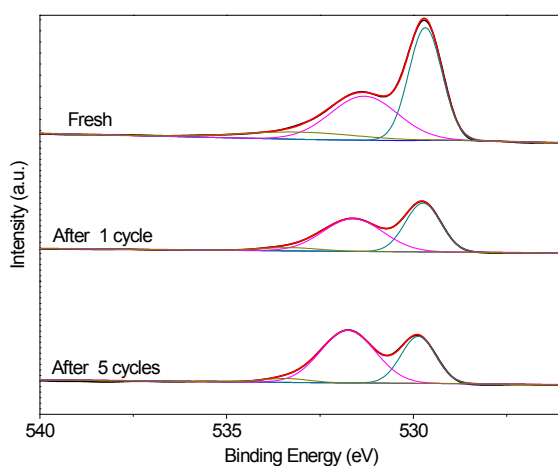
Fig. S4 TEM and HRTEM images of $\text{Co}_{0.7}\text{Cu}_{0.3}$ catalyst before and after reaction



a)



b)



c)

Fig. S5 XPS spectra of $\text{Co}_{0.7}\text{Cu}_{0.3}$ catalyst before and after reaction a) Co 2p spectra b) Cu 2p spectra and c) O 1s spectra

Table S2 XPS survey statistics of $\text{Co}_{0.7}\text{Cu}_{0.3}$ catalyst before and after reaction

Sample	Co 2p (%)			Cu 2p (%)			O 1s (%)		
	Co^{2+}	Co^{3+}	$\text{Co}^{3+}/\text{Co}^{2+}$	Cu^+/Cu^0	Cu^{2+}	$\text{Cu}^{2+}/(\text{Cu}^+/\text{Cu}^0)$	O_I	O_{II}	O_{III}
Fresh	39.77	60.23	1.51	88.83	11.17	7.95	10.24	40.68	49.08
After 1 cycle	40.64	59.36	1.46	88.23	11.77	7.50	4.85	50.53	44.62
After 5 cycles	42.75	57.25	1.34	85.46	14.54	5.88	3.77	61.49	34.74

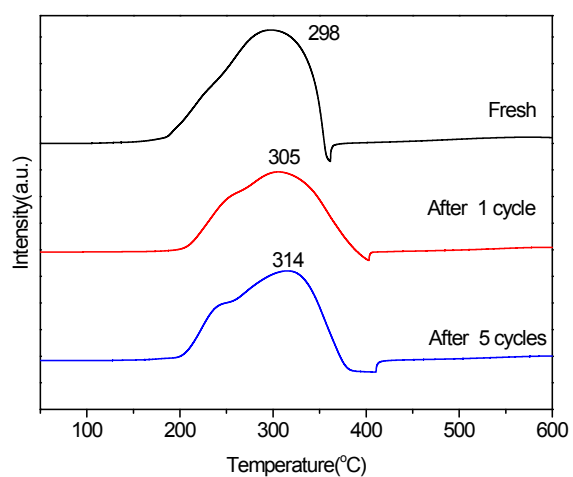


Fig. S6 H_2 -TPR profiles of $\text{Co}_{0.7}\text{Cu}_{0.3}$ catalyst before and after reaction