Supplementary Materials

Mechanistic Insights into the Structure of CoCu Bimetallic Catalysts for CO_2 Hydrogenation to Formate

Ruijing Dong[a b], Chao Wu[b,c], Truong-Giang Vo[b], San Hua Lim[b], Xun Cao[b], Jia'E Zheng[b], Xin Xiao[a], Wei Chu[a] *, and Yan Liu[b] *

[a] School of Chemical Engineering, Sichuan University, No. 24 South Section 1, Yihuan Road, Chengdu, 610065, China.

[b] Institute of Sustainability for Chemicals, Energy and Environment (ISCE^2), Agency for Science, Technology, and Research (A*STAR), 1 Pesek Road, Jurong Island, Singapore 627833, Republic of Singapore

[c] College of Materials Science and Engineering, Sichuan University, No. 24 South Section 1, Yihuan Road, Chengdu, 610065, China.

*Corresponding authors:

chuwei1965@scu.edu.cn (W Chu);

liu_yan@isce2.a-star.edu.sg (Y Liu).

Supplementary Figures

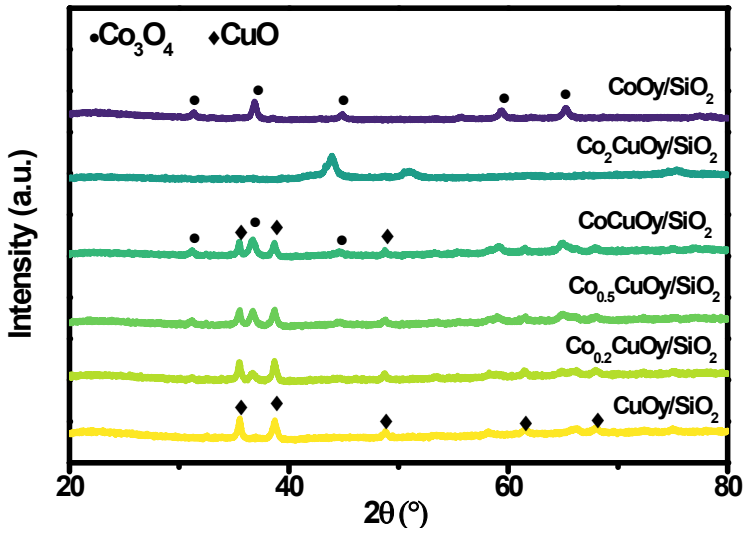

Fig. S1 XRD pattern of Co_xCuO_y/SiO_2 calcined at 500 °C

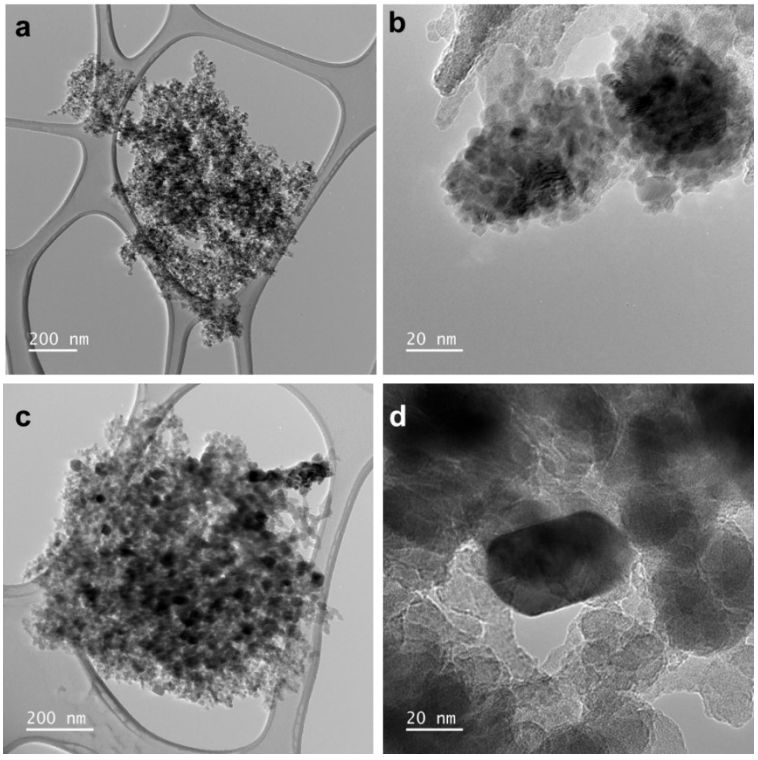

Fig. S2 TEM images at different magnification for (a, b) Co/SiO_2 and (c, d) Cu/SiO_2

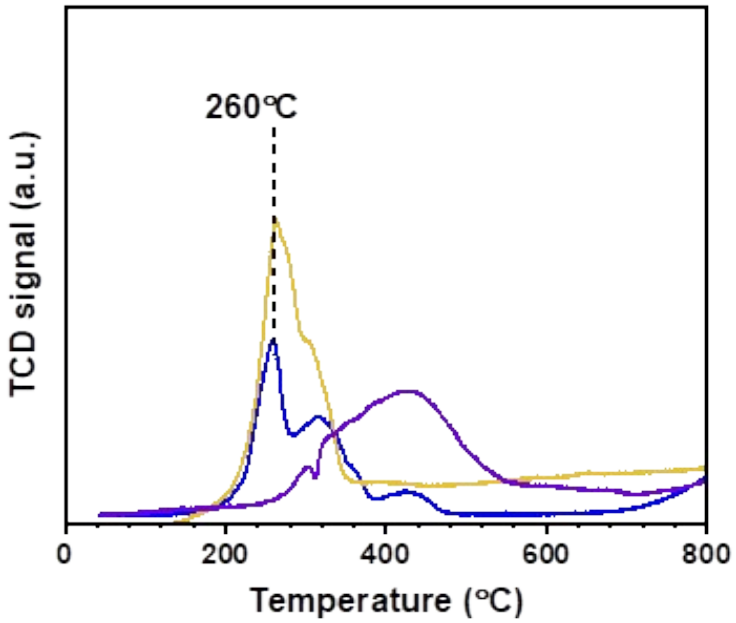

Fig. S3 The H_2-TPR profiles of CuO/SiO_2 (blue), Co_3O_4/SiO_2 (purple) and $CoCuO_y/SiO_2$ (orange) catalysts

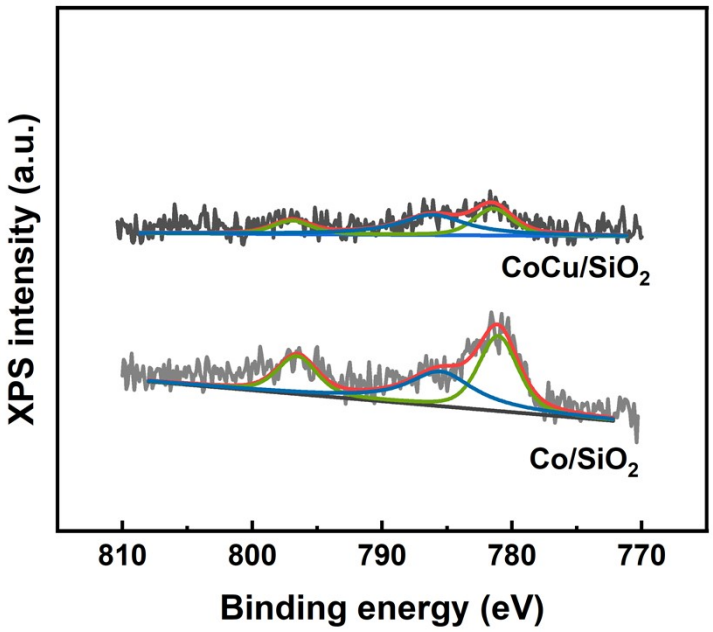

Fig. S4 High-resolution XPS spectra Co 2p spectra for Co/SiO_2 and $CoCu/SiO_2$

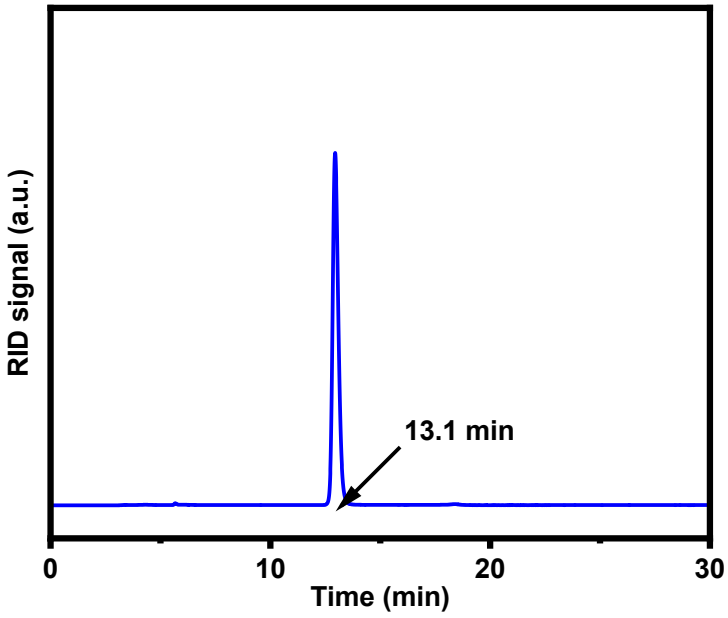

Fig. S5 HPLC profile of the liquid product obtained from CO_2 hydrogenation at optimal condition (150 °C, in NaOH, H_2/CO_2 3:1) over $CoCu/SiO_2$ catalyst

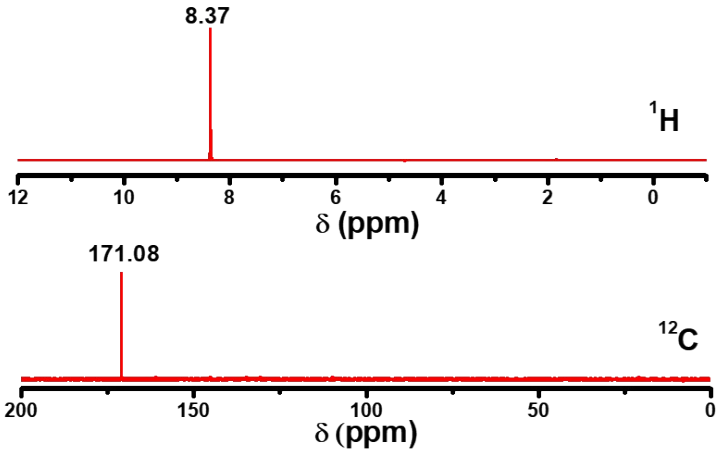

Fig. S6 NMR spectra of the liquid product obtained from CO_2 hydrogenation at optimal condition (150 ^{o}C, in NaOH, H_2/CO_2 3:1) over $CoCu/SiO_2$ catalyst

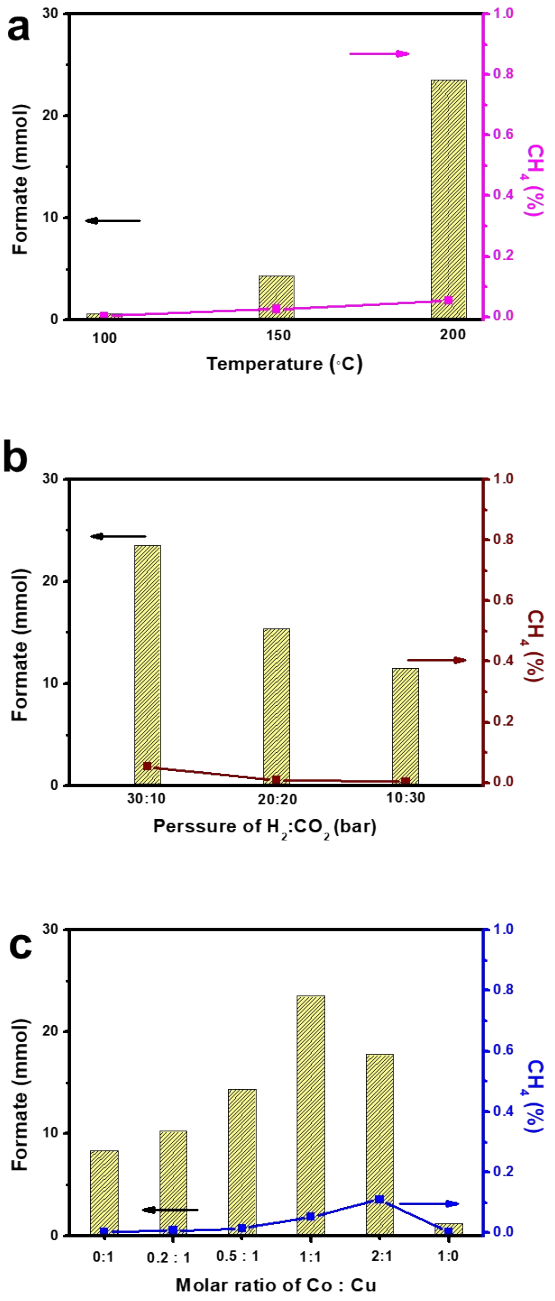

Fig S7. Formate yield and CH_4 content on $CoCu/SiO_2$ catalyst at different reaction temperature (a), different reaction pressure of H_2 and CO_2 (b), different molar ratio of Co and Cu (c)

Supplementary Tables

Table S1 XRF of Co_xCu/SiO_2 catalysts

Catalyst	Element (%）		Element ratio
	Co	Cu	Co:Cu
Cu/SiO_2	0	5.44	--
$Co_{0.2}Cu/SiO_2$	1.58	7.12	0.22
$Co_{0.5}Cu/SiO_2$	3.53	7.53	0.47
$CoCu/SiO_2$	6.97	8.06	0.86
Co_2Cu/SiO_2	11.70	7.54	1.55
Co/SiO_2	5.78	0	--