Co_3O_4-$CuCoO_2$ hybrid nanoplates as a low-cost and highly active catalyst for producing hydrogen from ammonia borane

Yufa Feng,[+a, b] Jinyun Liao,[+b] Xiaodong Chen, [b] Qingyu Liao, [b] Huize Wang, [b] Shan Ji, *[c] Bruno G. Pollet,[d] Hao Li,*[b] and Mingyang He*[a]

[a] *Jiangsu Key Laboratory of Advanced Catalytic Materials and Technology, Changzhou University, Changzhou, 213164, China.*
[b] *School of chemistry and Materials Engineering, Guangdong Provincial Key Laboratory for Electronic Functional Materials and Devices, Huizhou University, Huizhou 516007, China.*
[c] *College of Biological, Chemical Science and Chemical Engineering, Jiaxing University, Jiaxing, 314001, China.*
[d] *Hydrogen Energy and Sonochemistry Research Group, Department of Energy and Process Engineering, Faculty of Engineering, Norwegian University of Science and Technology, NO-7491 Trondheim, Norway.*

[+]These authors contributed equally to this work.
[*]Corresponding author.
E-mail address: lihao180@126.com (H. Li); jishan@zjxu.edu.cn (S. Ji); hmy@cczu.edu.cn (M. He)

Supporting information

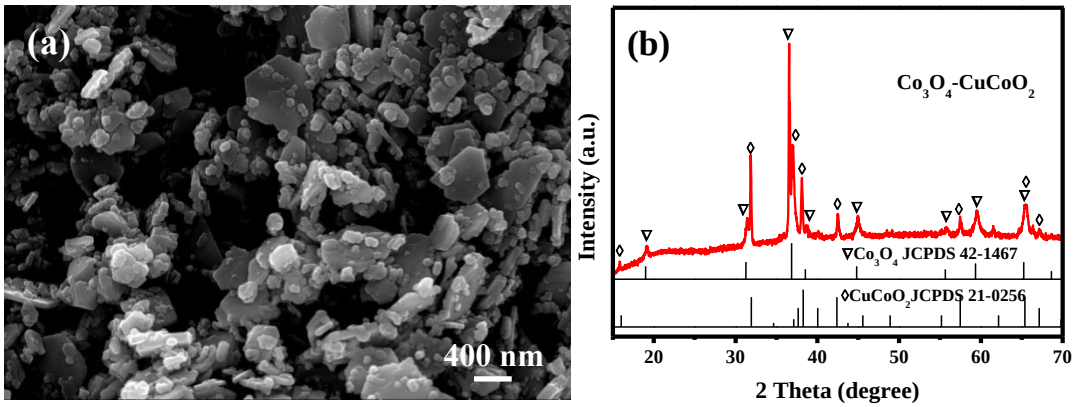

Fig. S1. SEM image (a) and XRD pattern (b) of Co_3O_4-$CuCoO_2$ synthesized in the absence of SDDS in the synthetic process.

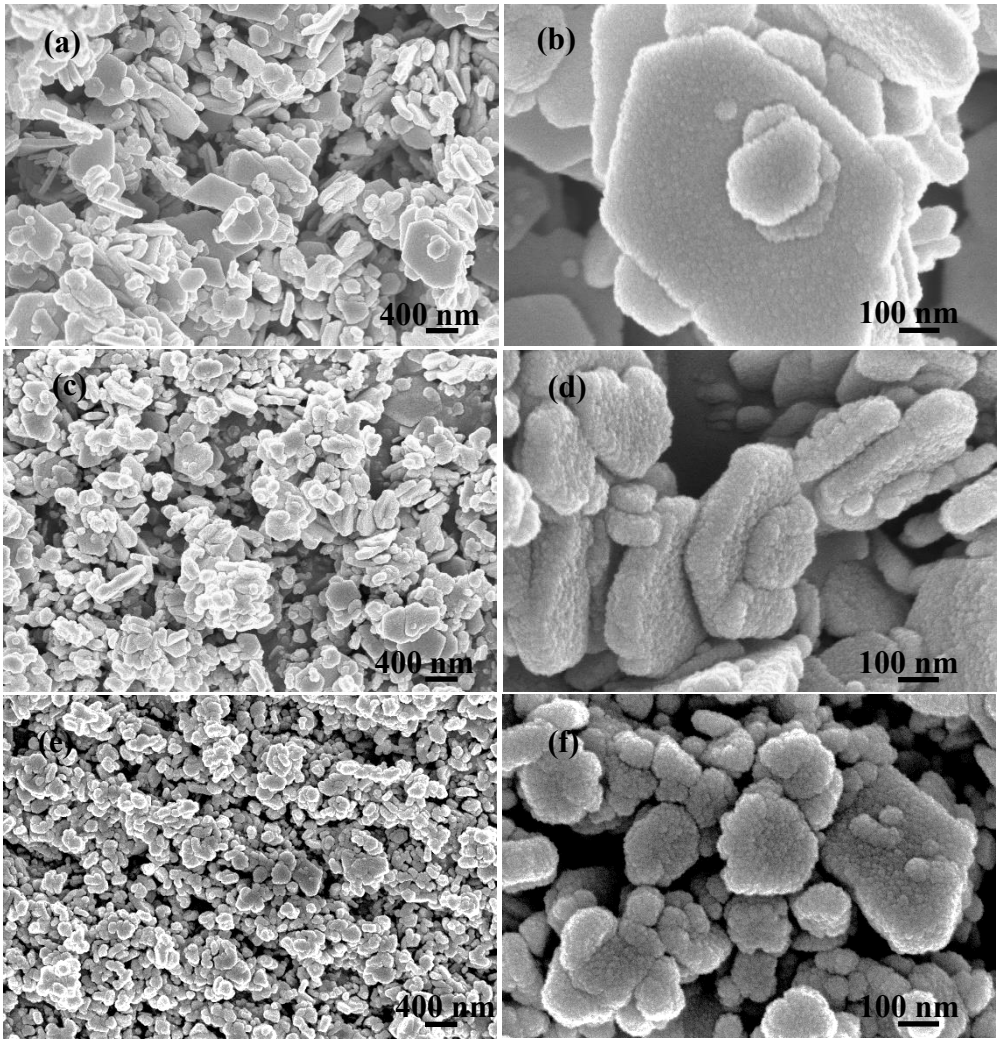

Fig. S2. SEM images of Co_3O_4-$CuCoO_2$ with various Cu:Co ratio: 1:10 (a, b), 1:5 (c, d) and 1:2 (e, f).

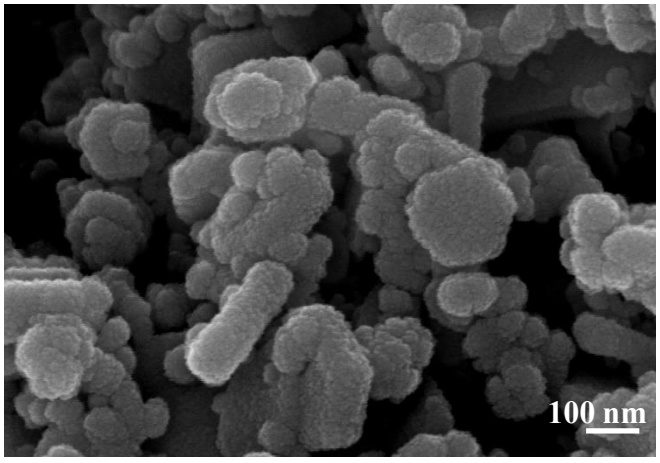

Fig. S3. SEM image of used Co_3O_4-$CuCoO_2$.

Illustration S1: Calculation of E_a

The E_a value can be calculated by the Arrhenius equation:

$$\ln k = -E_a/(RT) + \ln A$$

in which k is the hydrolysis reaction rate constant, R is the molar gas constant (8.3145 J K^{-1} mol^{-1}), T is the reaction temperature (K) and A is the pre-exponential factor.

As shown in Fig. 9a, the values of k can be determined from the linear portions of the volume of hydrogen vs. time plots.