Highly Active CoNi Nanoparticles Confined in N-doped Carbon Microtubes for Efficient Catalytic Performance

Xiaoying He[a], Min Zhang[a], Ziqi Jin[a], Jing Zheng[a], Jingli Xu[a], Xue-Bo Yin*[a]*

[a] College of Chemistry and Chemical Engineering, Shanghai University of Engineering Science, Shanghai 201620, China.

*Corresponding author: zhangmin@sues.edu.cn (Min Zhang) xbyin@nankai.edu.cn(Xue-Bo Yin)

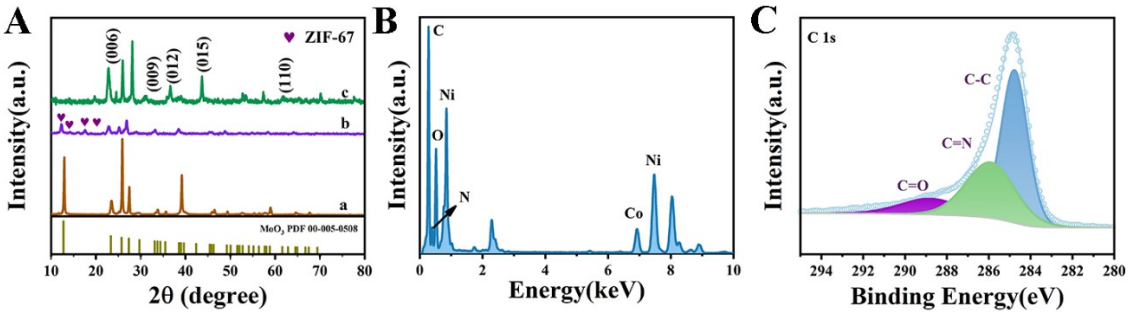


Fig. S1, (A)XRD images of MoO_3 (a), MoO_3@ZIF-67 (b) and MoO_3@CoNi-LDH and(B)EDX spectrum of CoNi@NCMTs-500 (C)XPS C1s spectrum of CoNi@NCMTs-500

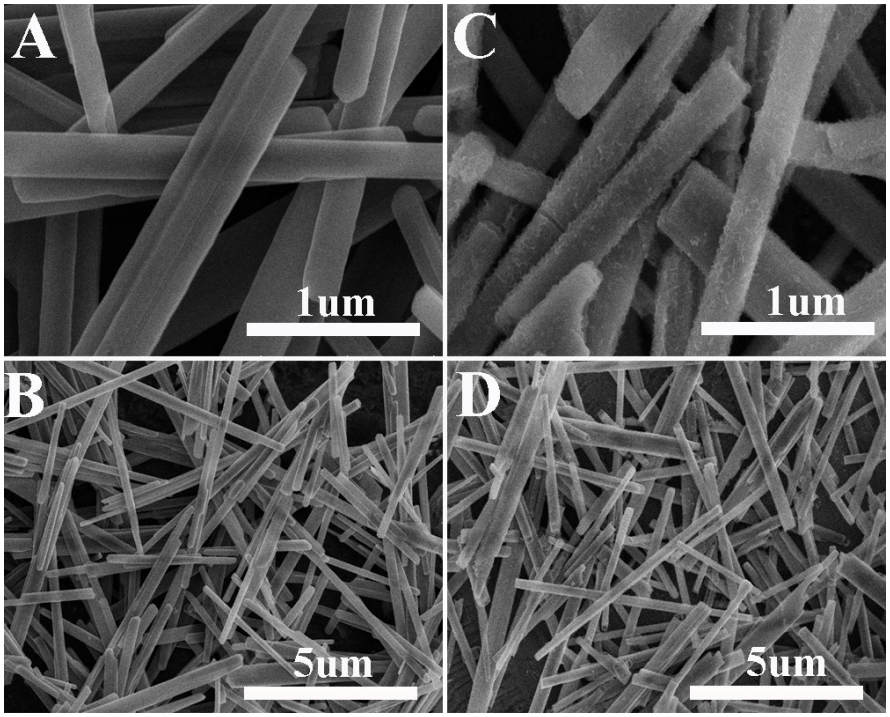


Fig. S2 SEM images of the resultant product: the reaction solvent of MoO_3 with Ni^{2+} is anhydrous ethanol (A, B) (1h) and the mixed solution(1h) (ethanol and water 1:1 (C, D))

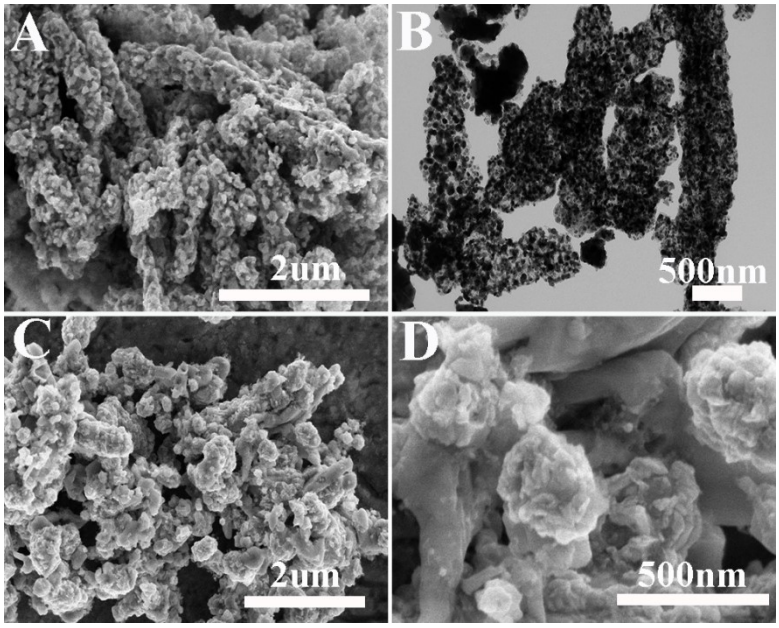


Fig. S3 SEM and TEM images of CoNi@NCMTs-700 (A, B); SEM images of CoNi@NCMTs-800 with different magnification (C, D)

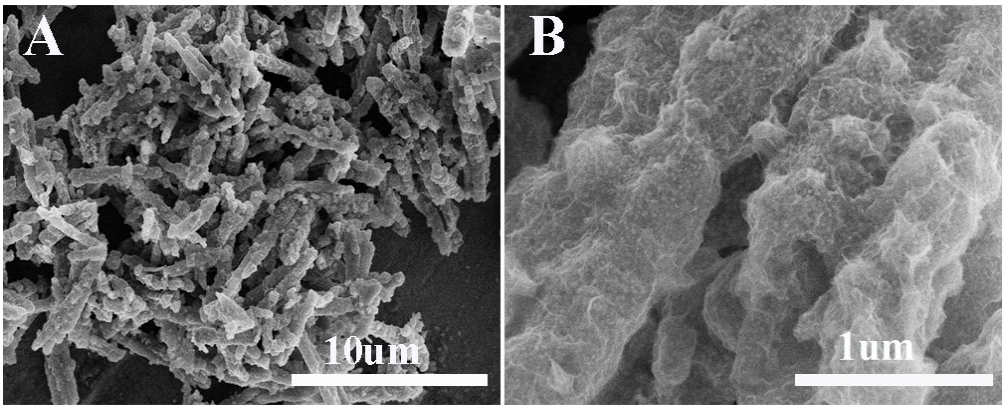


Fig. S4 SEM images of CoNi@NCMTs-500 after five catalytic reactions

Table S1 the element relative amount of CoNi@NCMTs-500

Element	Mass%	Atom%
C	51.26	73.94
O	11.59	12.55
N	2.71	3.36
Ni	26.66	7.87
Co	7.78	2.29

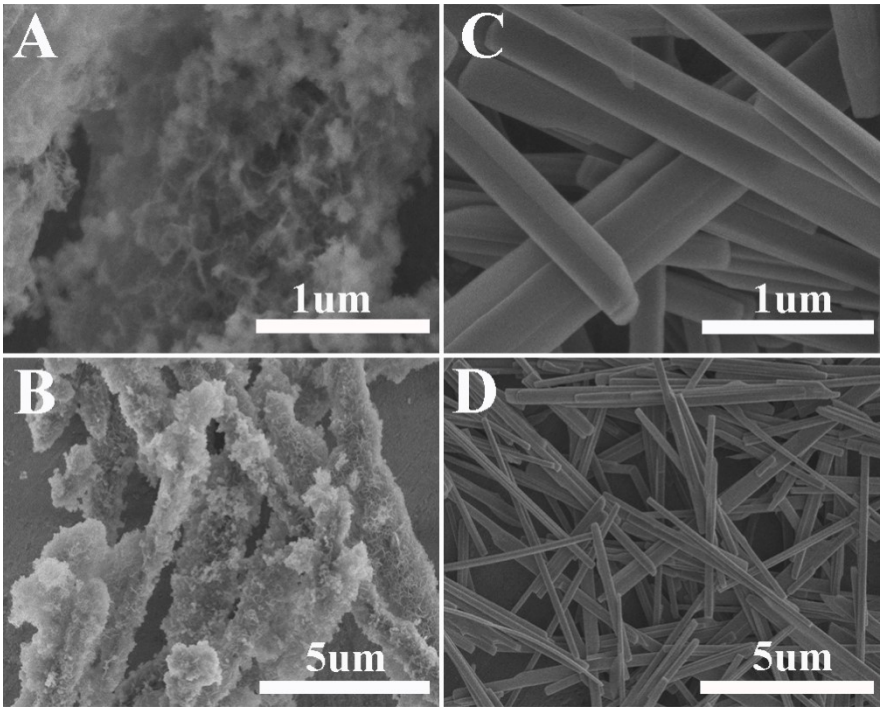
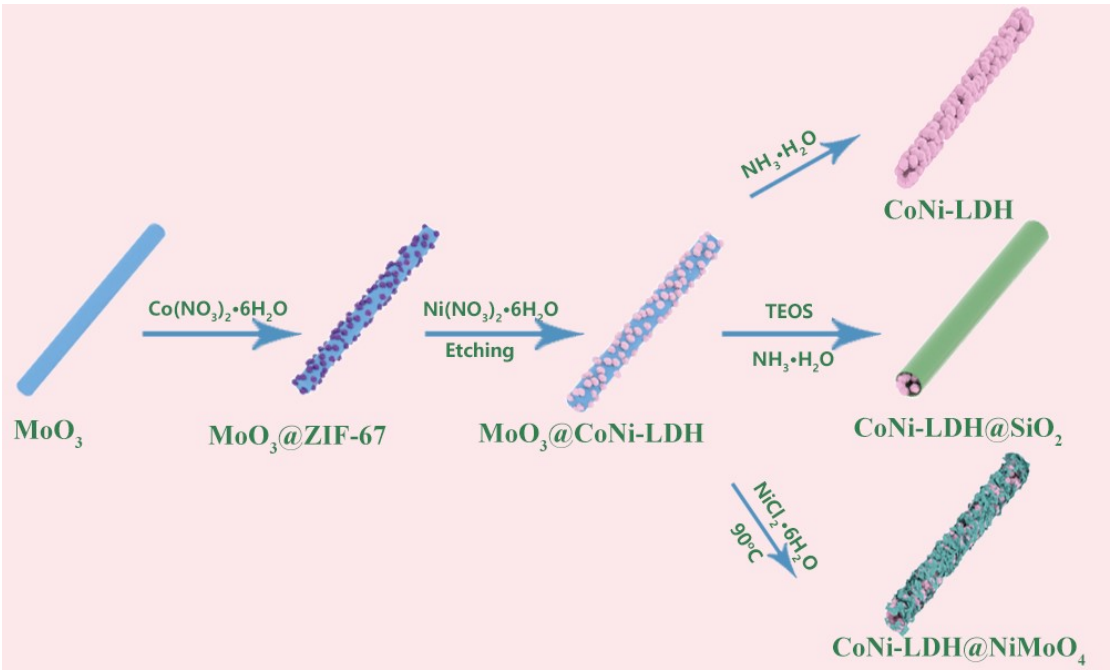


Fig. S5 SEM images of the resultant product: the reaction time of MoO_3@ZIF-67(A, B) and MoO_3 with Ni^{2+} increased to 24 h (C, D) in ethanol and water 1:1



Scheme S1. Schematic illustration for the synthesis of CoNi-LDH, CoNi-LDH@SiO_2 and CoNi-LDH@$NiMoO_4$ composites with the MoO_3@CoNi-LDH as the templates