A facile template method to fabricate strongly coupled 1D sandwich-like C@Fe$_3$O$_4$@C/Ni coaxial microtubes with enhanced catalytic performance

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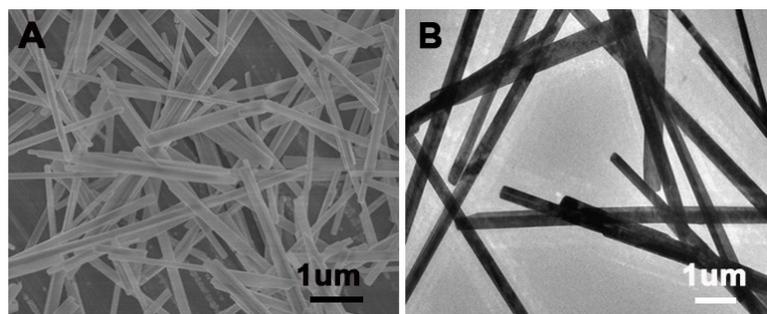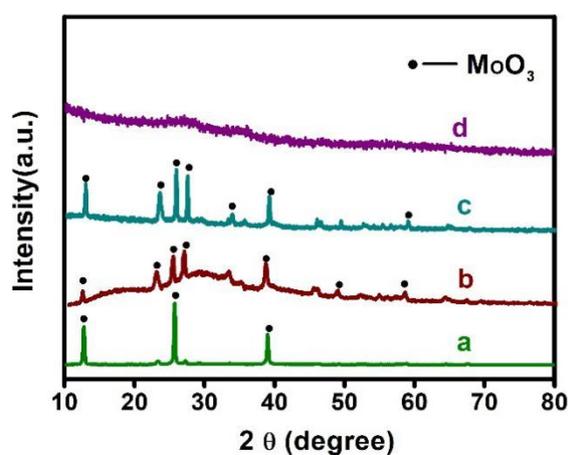
Fig.S1 SEM and TEM images of MoO$_3$ (A, B).

Fig.S2 XRD patterns of the as-prepared MoO$_3$ (a), MoO$_3$@PPy (b), MoO$_3$@PPy@FeOOH (c) and PPy@FeOOH@RF-Ni^{2+}(d).
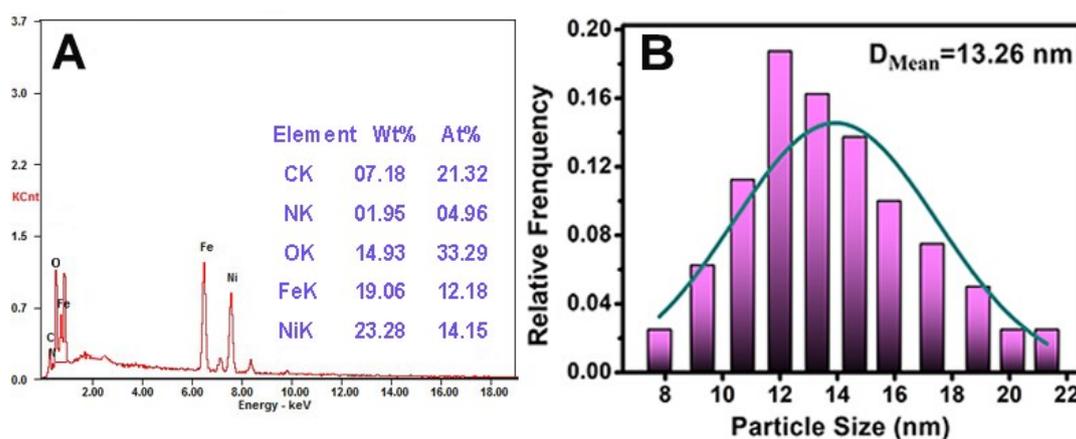

Fig.S3 (A) EDX spectrum of C@Fe$_3$O$_4$@C/Ni-500 and the text inserted is the content of the element; (B) Size distribution of Ni nanoparticles distributed on coaxial microtubes.
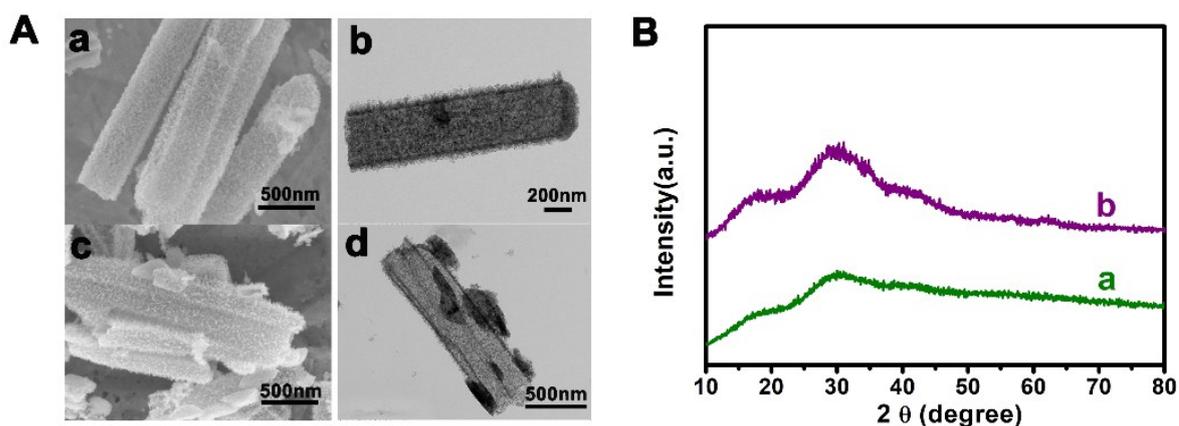
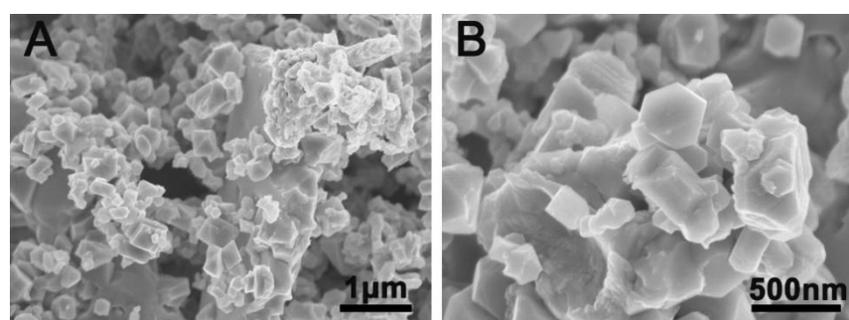Fig.S4 (A) SEM and TEM images of PPy@FeOOH@RF (a, b) and C@Fe$_3$O$_4$@C (c, d); (B) XRD pattern of PPy@FeOOH@RF (a) and C@Fe$_3$O$_4$@C (b).
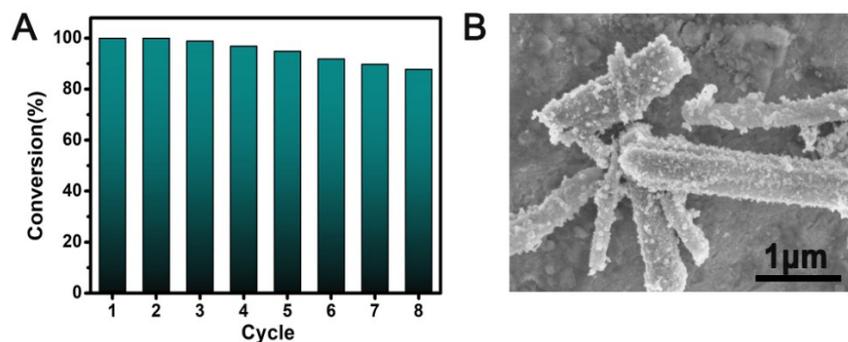

Fig.S5 SEM images of C@Fe$_3$O$_4$@C/Ni-900(A, B).

Fig.S6 Recyclability of the C@Fe$_3$O$_4$@C/Ni-500 as the catalyst (A); SEM image of C@Fe$_3$O$_4$@C/Ni-500 after cycle (B).

Table S1. ICP data of different samples and comparison for the reduction of 4-NP.

Samples	Ni content (μg/mg)	K (×10^{-3}s^{-1})	κ (mg^{-1}s^{-1})
C@Fe$_3$O$_4$@C/Ni-500	28.6	10.9	0.381
C@Fe$_3$O$_4$@C/Ni-700	30.5	5.4	0.177