Electronic Supplementary Material (ESI) for Nanoscale.


# Unraveling Template-free Fabrication of Carbon Nitride Nanorods Codoped with for Efficient Electrochemical and Photoelectrochemical Carbon Monoxide Oxidation at Room Temperature

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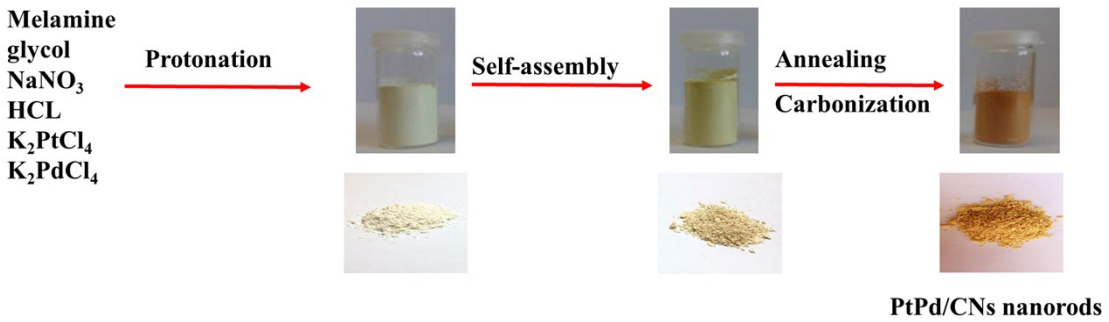


**Figure S1**. Schematic shows the synthesis process of PtPd/CNs nanorods

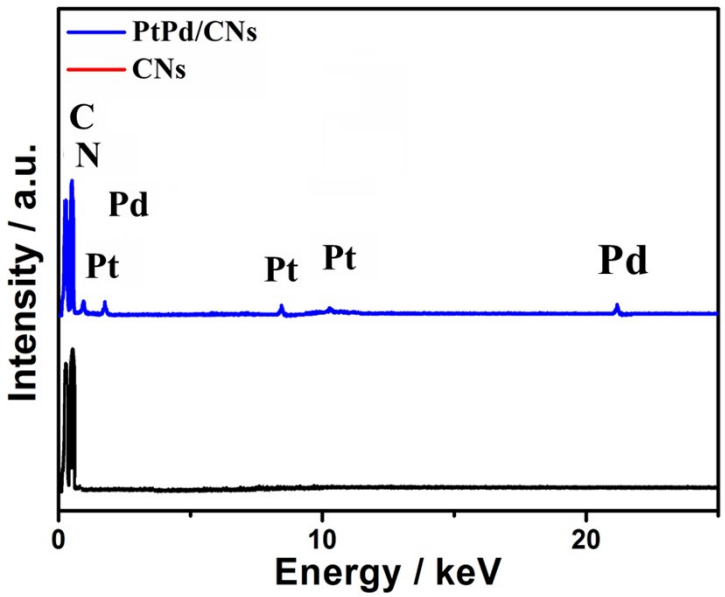


**Figure S2**. EDX analysis of PtPd/CNs nanorods relative to metal-free CNs nanorods.

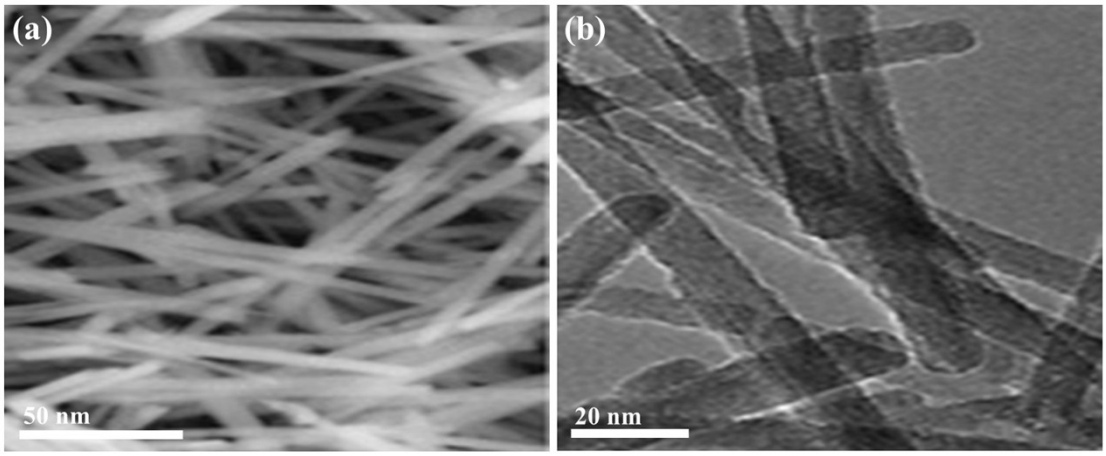


**Figure S3** (a) SEM image and (b) TEM image of metal-free CNs nanorods.

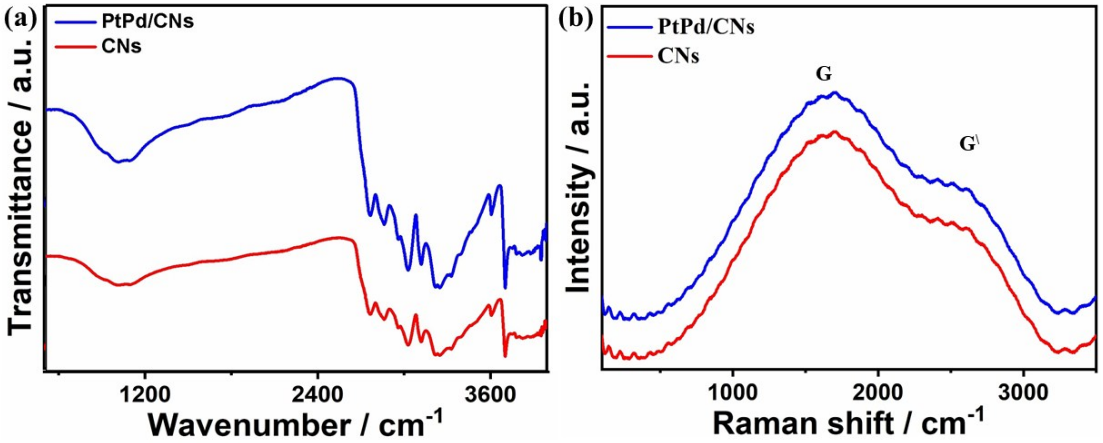


**Figure S4.** (a) FTIR spectra and (b) Raman spectra of PtPd/CNs nanorods relative to CNs nanorods.

**Table S1.** Comparison the Surface area of our developed CNs nanorods with previous reported CNs-based nanostructures

| **Catalyst** | **Morphology** | **BET surface area $m^2g^{-1}$** | **Reference** |
|---|---|---|---|
| CNs | Nanorods | 155.2 | Our work |
| CN600 | Long Needles | 99 | [1] |
| CNs | Nanotubes<br>Nanofibers | 32.27<br>12.96 | [2] |
| CNs | Nanosheets | 46.2 | [3] |
| CNs | Nanosheets | 84.2 | [4] |
| CNs- Triton-0.6 | Nanoporous sheets | 116 | [5]1 |
| $C_3N_4$ | Nanoporous sheets | 123 | [6] |
| CN-24-1.0<br>1= | Nanoporous sheets<br>24 represents size of colloidal $SiO_2$<br>1 represents $SiO_2$/cyanamide ratio | 130 | [7] |

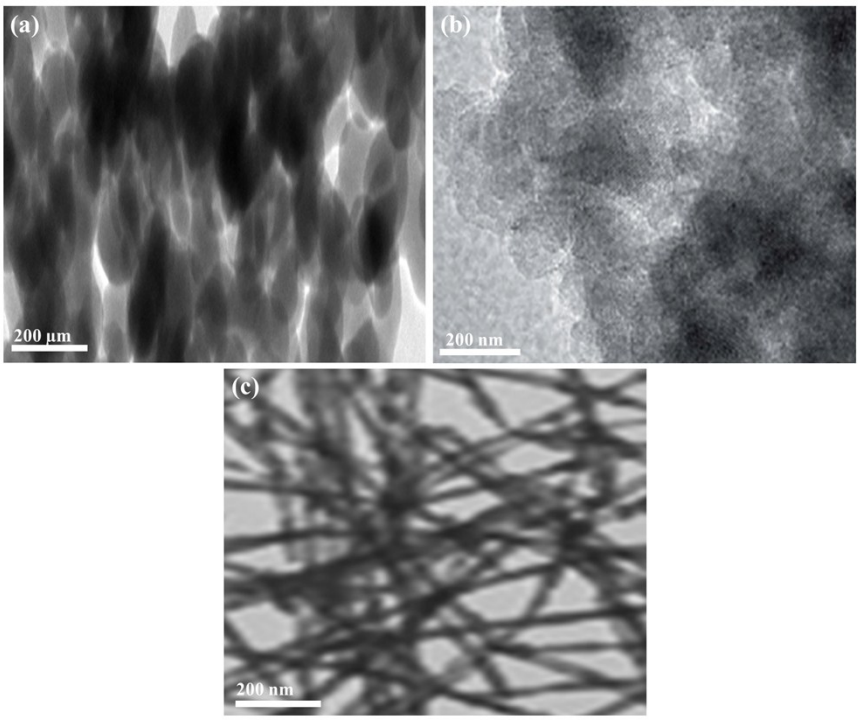


**Figure S5** (a) TEM images of aggregated CNs prepared in the absence of $NaNO_3$ and HCL solutions, (b) CNs nanosheets obtained by the quick addition of NaNO3 and HCL solution, and (c) CNs nanowires formed using ethanol-mediated solution instead of glycol-mediated solution.

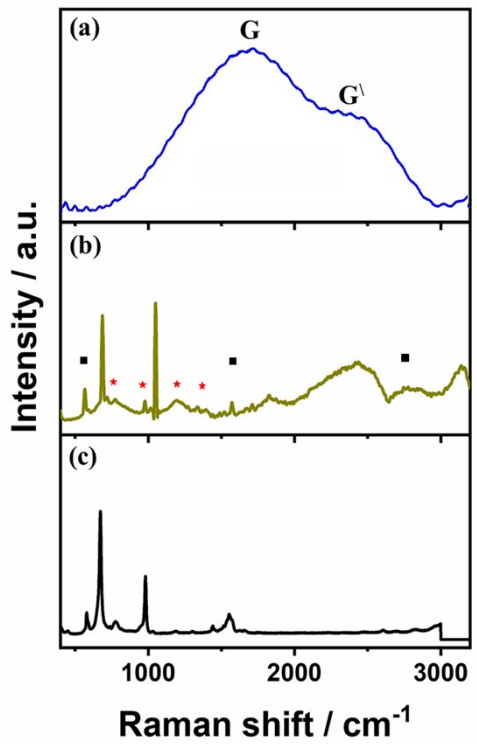


**Figure S6.** Raman spectra of (a) PtPd/CNs nanorods, (b) Pt/Pd/melon formed after polymerization of melamine, and (c) pure melamine. The asterisks and boxes indicate the Pt/Pd bonded to N and polycondensation of melamine.

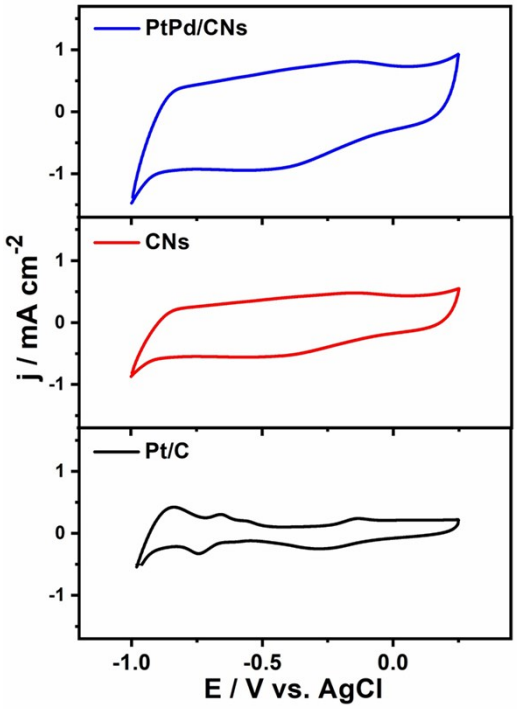


**Figure S7**. CVs of the PtPd/CNs and CNs nanorods compared to commercial Pt/C catalyst in $N_2$-staurated aqueous solution of 0.1 M KOH at 50 mV $s^{-1}$ at room temperature.

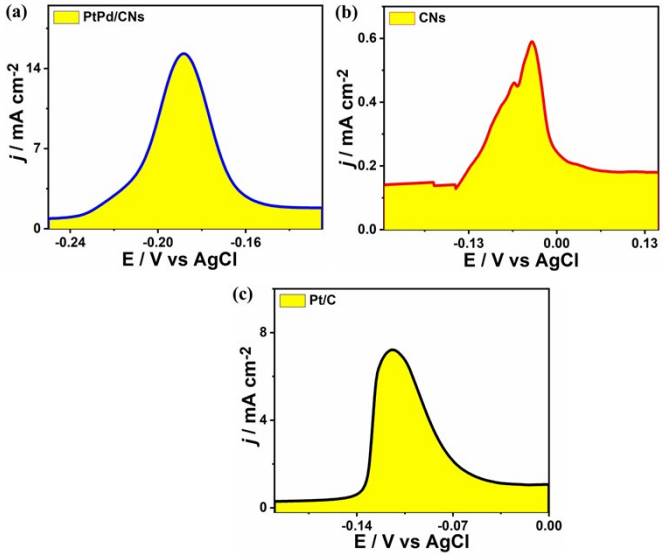


**Figure S8.** The Co-adsorbed amount over the as-synthesized materials.

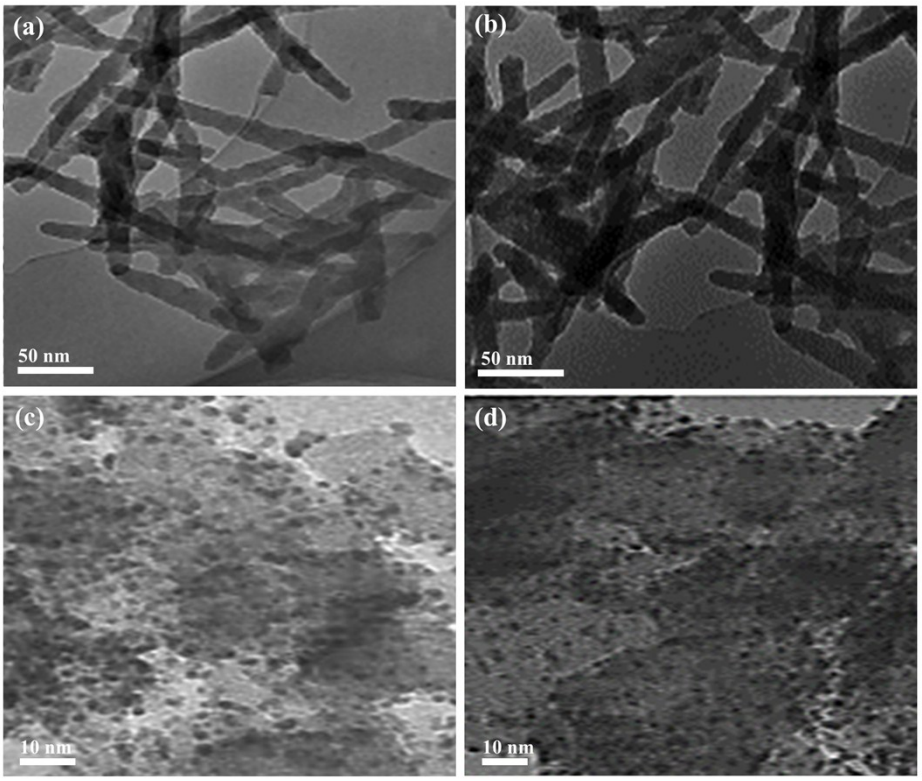


**Figure S9.** TEM image of (a-b) PtPd/CNs nanorods and (c-d) before and after CO-durability tests, respectively.

## References

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