Thermally Driven Interfacial Diffusion Synthesis of Nitrogen-Doped Carbon Confined Trimetallic Pt₃CoRu Composites for Methanol Oxidation Reaction

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Figure S1. Schematic fabrication of trimetallic Pt₃CoRu/C@NC catalyst based on thermally driven interfacial diffusion alloying method.
Figure S2. The TEM and HR-TEM images of the prepared Pt₃CoRu/C@NC sample.

Figure S3. TEM images and the corresponding particle size statistics of the Pt₃CoRu/C@NC and commercial Pt/C catalysts after high-temperature annealing.
**Figure S4.** The HRTEM images of the Pt\(_3\)CoRu/C@NC catalysts.

**Figure S5.** The Ru/Pt and Co/Pt atomic ratio from EELS and the corresponding EDX profile and atomic fraction of the Pt\(_3\)CoRu/C@NC NP.
Figure S6. HAADF-STEM images of the Pt₃CoRu/C@NC catalysts (a) and the corresponding elemental mapping (b-h).

Figure S7. The EDX profile and corresponding atomic fraction of the Pt₃CoRu/C@NC catalyst.
Figure S8. The illustration of the corresponding pyrrolic-N and pyridinic-N quaternary-N respectively.

Figure S9. The detailed CO stripping curves of the Pt₃CoRu/C@NC and commercial Pt/C catalysts.

Figure S10. The TEM images of the Pt/C and Pt₃CoRu/C@NC catalyst after under a constant potential of 0.75VRHE for 6000s.
Catalysts | \( I_{\text{onset}} \) | Onset Potential (V) of CO oxidation (vs RHE) | Peak currents from CV curves | Electrolytes | References
---|---|---|---|---|---
Fe@PtRu NPs | --- | 0.295 vs NHE | 0.819 | 0.1 M HClO\(_4\) + 1 M Methanol | 1
PtRuFe NWs | --- | 0.41 | --- | 2.4 | 0.1 M HClO\(_4\) + 0.5 M Methanol | 2
PtPdRu spheres | 0.97 | --- | 0.294 | --- | 0.5 M HClO\(_4\) + 0.5 M Methanol | 3
FePtPd NWs | 1.09 | --- | 0.489 | --- | 0.1 M HClO\(_4\) + 0.2 M Methanol | 4
PtRuFe/C | --- | 0.4 | 0.11 | 1.31 | 1 M \( \text{H}_2\text{SO}_4 \) + 1 M methanol | 5
PtRuFe/C | --- | 0.3 | 0.107 | 1.22 | 1 M \( \text{H}_2\text{SO}_4 \) + 1 M Methanol | 5
Au/Ag/Pt | --- | --- | 0.98 | 1.33 | 1 M \( \text{H}_2\text{SO}_4 \) + 1 M Methanol | 6
PtRuCu/C dendrites | 1.32 | 0.47 | 1.13 | 1.20 | 0.1 M HClO\(_4\) + 1 M Methanol | 7
PtCoRu/C@NC | 2.50 | 0.35 | 0.97 | 1.60 | 0.1 M HClO\(_4\) + 0.5 M Methanol | This work

**Table S1.** A brief comparison of the MOR electrochemical activity of the catalysts reported in the currently literature to the trimetallic PtCoRu/C@NC catalyst.

**Reference:**


