Construction of Cu-Ce/graphene catalysts via one-step hydrothermal method and their excellent CO catalytic oxidation performance

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Table S1 Relative contents of O 1s in various chemical states.

| Samples          | Chemical states | Binding energy (eV) | Oxygen percent (%) |
|------------------|-----------------|--------------------|--------------------|
|                  | O\(_\alpha\)    | 529.1              | 2.91               |
| 3Cu5Ce/graphene  | O\(_\beta\)     | 531.67             | 55.36              |
|                  | O\(_\gamma\)    | 533.02             | 41.73              |
|                  | O\(_\alpha\)    | 529.47             | 17.97              |
| 4Cu4Ce/graphene  | O\(_\beta\)     | 531.83             | 56.65              |
|                  | O\(_\gamma\)    | 533.10             | 25.38              |
|                  | O\(_\alpha\)    | 529.55             | 28.69              |
| 5Cu3Ce/graphene  | O\(_\beta\)     | 531.59             | 58.36              |
|                  | O\(_\gamma\)    | 533.36             | 12.95              |
|                  | O\(_\alpha\)    | 530.22             | 16.4               |
| Used             | O\(_\beta\)     | 531.64             | 53.0               |
| 5Cu3Ce/graphene  | O\(_\gamma\)    | 533.54             | 30.6               |

Table S2 Results of H\(_2\)-TPR analysis.
| Samples            | Temperature of peaks (°C) |
|--------------------|---------------------------|
|                    | α  | β  | γ  | δ  |
| 3Cu5Ce/graphene    | 253| 379| 533| 630|
| 4Cu4Ce/graphene    | 230| 399| 565| 653|
| 5Cu3Ce/graphene    | 208| 414| 574| 671|
| Ce/graphene        | -  | -  | 576| 639|
| Cu/graphene        | 223| 515| -  | 614|
Fig. S1 SEM (a,b) and TEM (c) images of 5Cu3Ce/graphene, HRTEM images of 3Cu5Ce/graphene (d), 4Cu4Ce/graphene (e) and 5Cu3Ce/graphene (f) catalysts, and elemental mapping of C, O, Ce, Cu for 5Cu3Ce/graphene catalyst (g).
Fig. S2 Arrhenius plots of the 3Cu5Ce/graphene, 4Cu4Ce/graphene and 5Cu3Ce/graphene catalysts for CO oxidation.