Electronic Supplementary Material (ESI) for Analytical Methods.

Supporting Information

Catalytic activity for CO oxidation of Cu-CeO_2 composite nanocubes synthesized by a hydrothermal method

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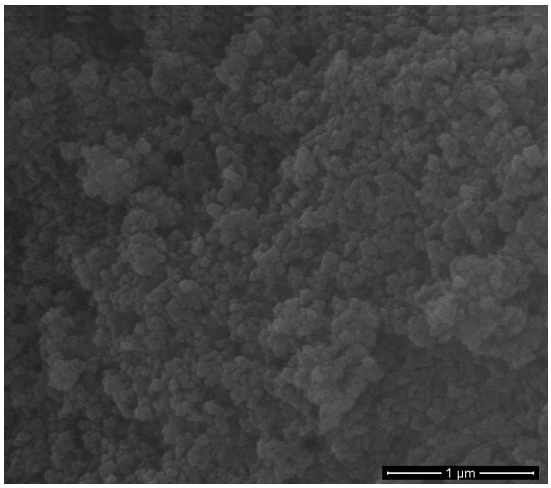

Figure S1 SEM image of 30Cu-CeO_2 composite nanoparticles.

SEM image revealed that there were various sizes of particles in the 30Cu-CeO_2 nanoparticles. Most particles are irregular morphology and the large particles were composed of small crystallites.

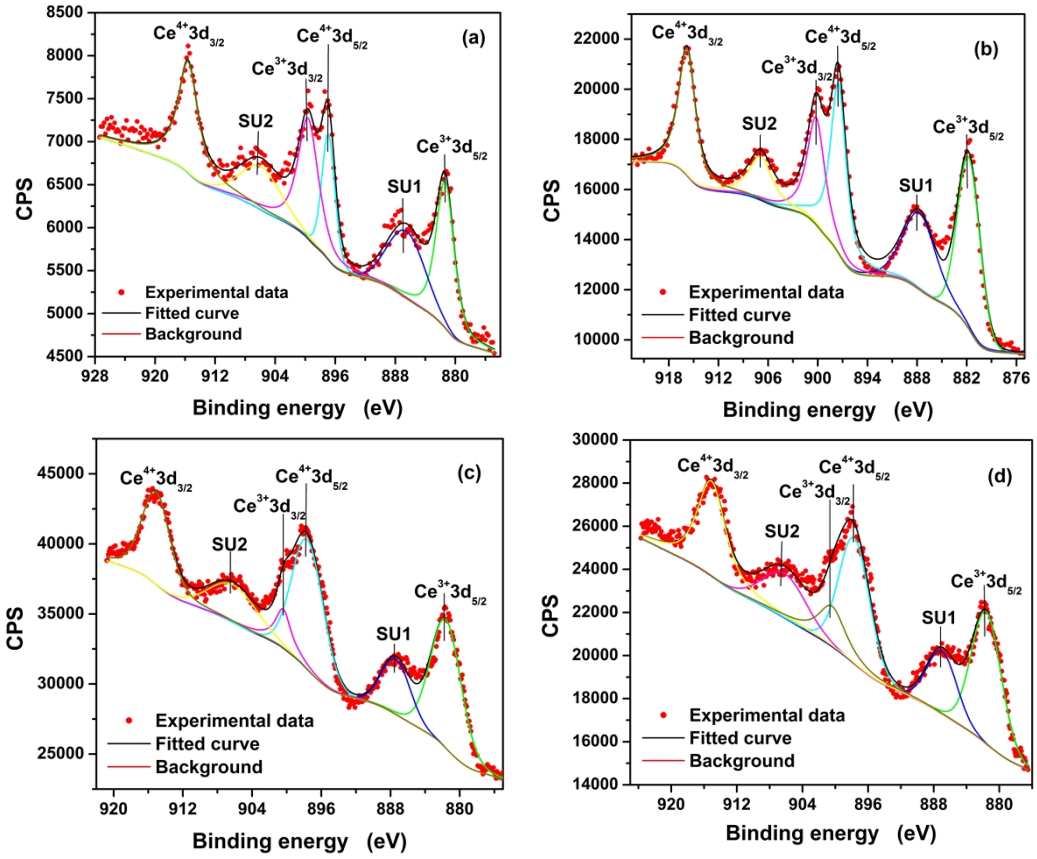

Figure S2 The high-resolution XPS spectra of Ce3d obtained on Cu-CeO_2 composite nanoparticles with the different Cu contents: (a) CeO_2, (b) 10Cu-CeO_2, (c) 30Cu-CeO_2, and (d) 40Cu-CeO_2, respectively.

The main features are composed of six peaks corresponding to the three pairs of spin–orbit doublets. Due to its highly non-stoichiometric nature, both valences (3+ and 4+) are present in CeO_2. The main peaks of Ce^{4+} $3d_{3/2}$ and Ce^{4+} $3d_{5/2}$ are shown at binding energies of ~915.7 and ~897.0 eV, respectively. Those of Ce^{3+} $3d_{3/2}$ and Ce^{3+} $3d_{5/2}$ are located at ~899.8 and ~881.7 eV. Two additional satellite lines SU1 and SU2, which means 'shake-up', are shown at ~906.2 eV on the Ce^{3+} $3d_{3/2}$ and at ~887.1 eV on the Ce^{3+} $3d_{5/2}$, respectively.

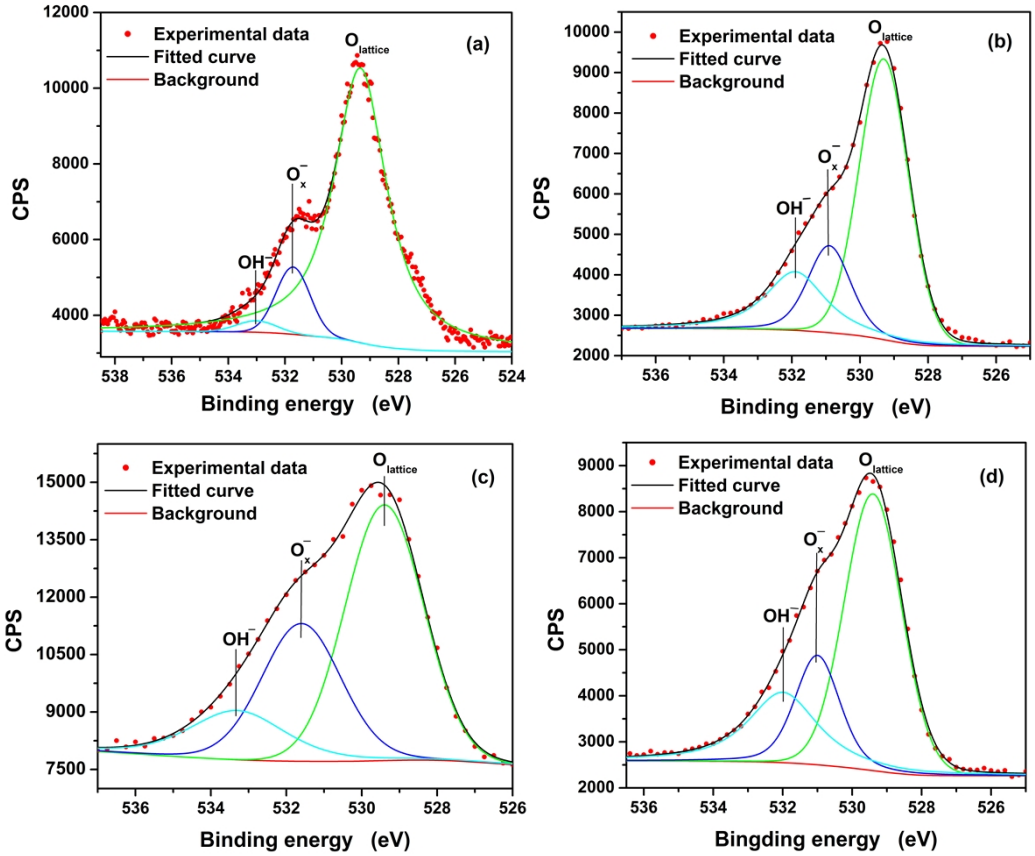

Figure S3 XPS region spectra of O1s obtained on Cu-CeO_2 composite nanoparticles with the different Cu contents: (a) CeO_2, (b) 10Cu-CeO_2, (c) 30Cu-CeO_2, and (d) 40Cu-CeO_2, respectively.

All the spectra show a peak at about 529.4 eV, which is assigned to oxygen ions ($O_{lattice}$) in CeO_2. Two evident shoulders at higher binding energies at ~531.7 and ~533 eV are present and attributable to oxygen vacancies and hydroxyl groups, respectively.

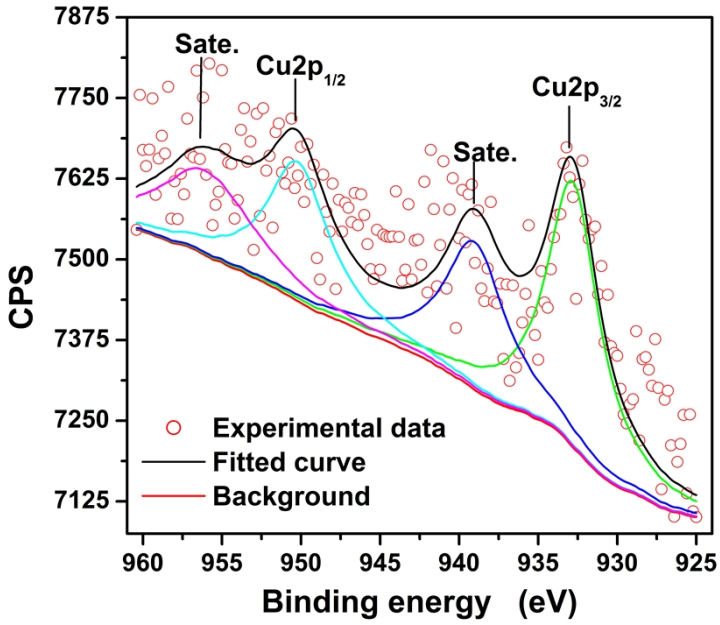

Figure S4 The high-resolution XPS spectrum of superposed Cu2p for 30Cu-CeO_2 composite nanoparticles.

The XPS spectra for Cu were simple and easily fitted to Cu^0 species, indicating little oxidation of the Cu nanoparticles.

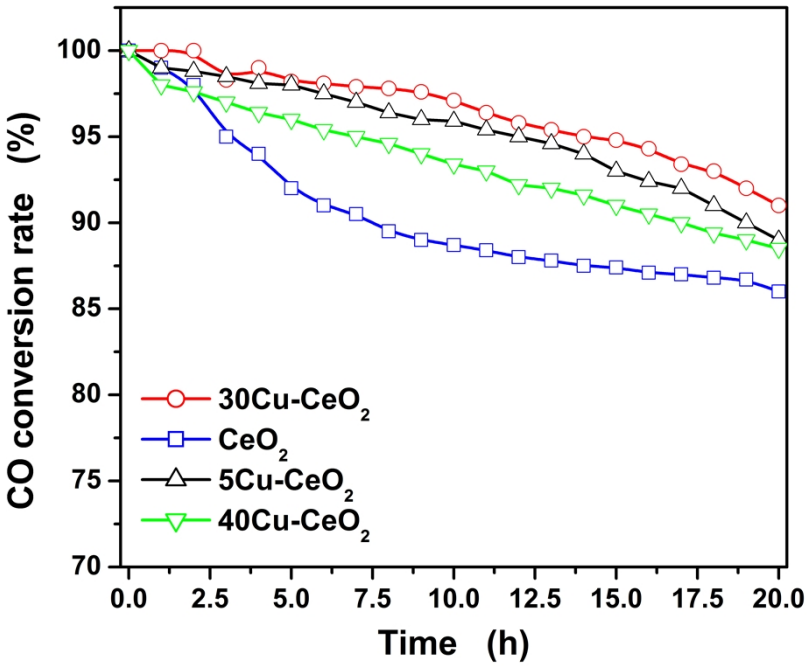

Figure S5 Time-on-stream CO conversion on Cu-CeO_2 composite nanoparticles (CeO_2 nanoparticles at 260 ^oC, 5Cu-CeO_2 composite at 340 ^oC, 30Cu-CeO_2 composite at 180 ^oC, and 40Cu-CeO_2 composite at 200 ^oC, respectively).

Table S1 The phase compositions of Cu-CeO_2 composite nanoparticles from XRD patterns.

Phase composition (Cu/CeO_2)	Cu-CeO_2 composite nanoparticles					
	0%Cu	5%Cu	10%Cu	20%Cu	30%Cu	40%Cu
Cu	0	2.61	8.03	14.1	24.1	5.7
CeO_2	100	97.39	91.97	80.3	70.8	40.9
CuO	0	0	0	5.6	5.1	53.4