Supporting Information

Activation and deactivation of Ag/CeO_2 during soot oxidation: Influences of interfacial ceria reduction

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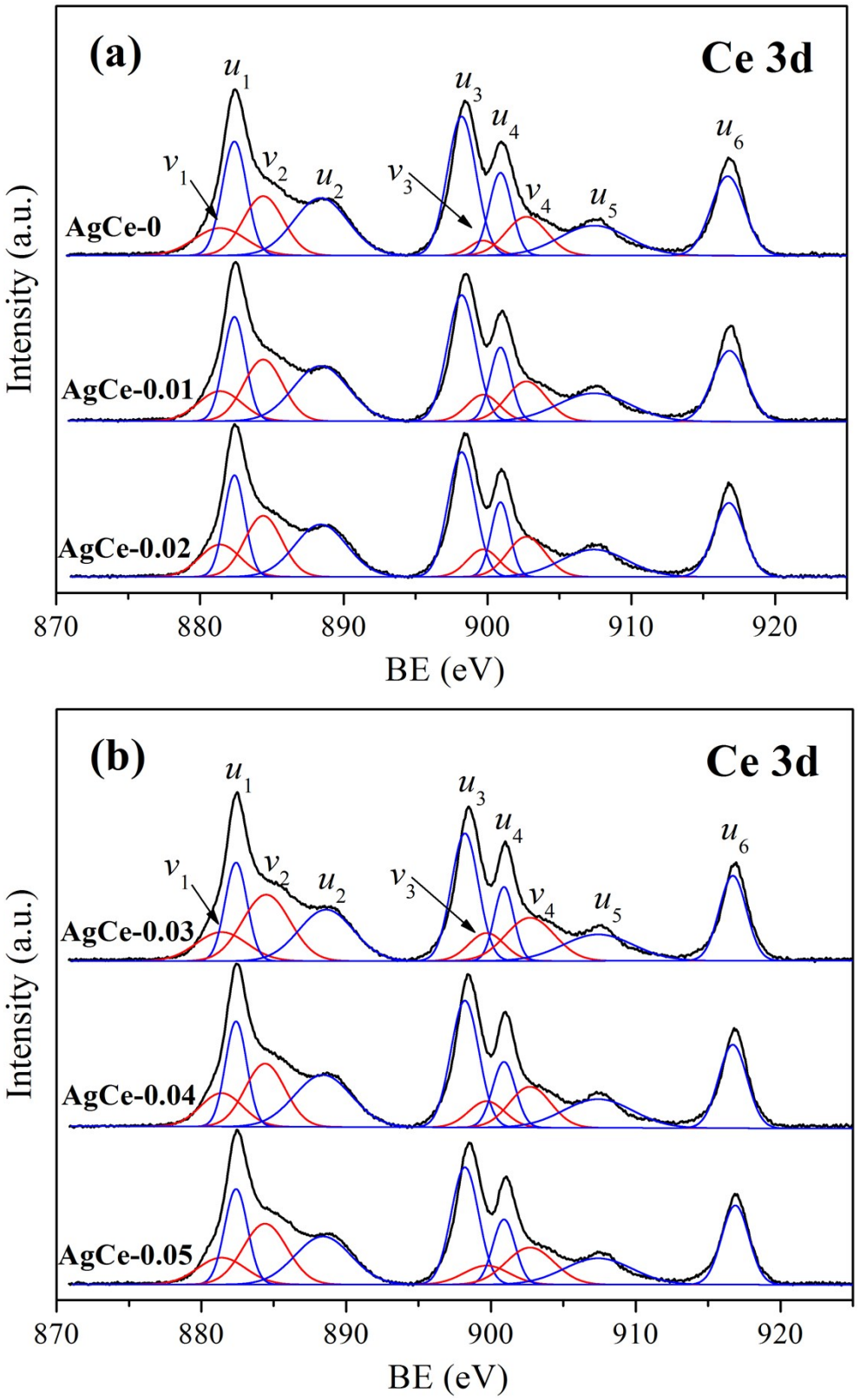

Fig. S1 Deconvolution of the Ce3d XPS spectra. The red and blue curves are related with Ce^{3+} and Ce^{4+} species, respectively.

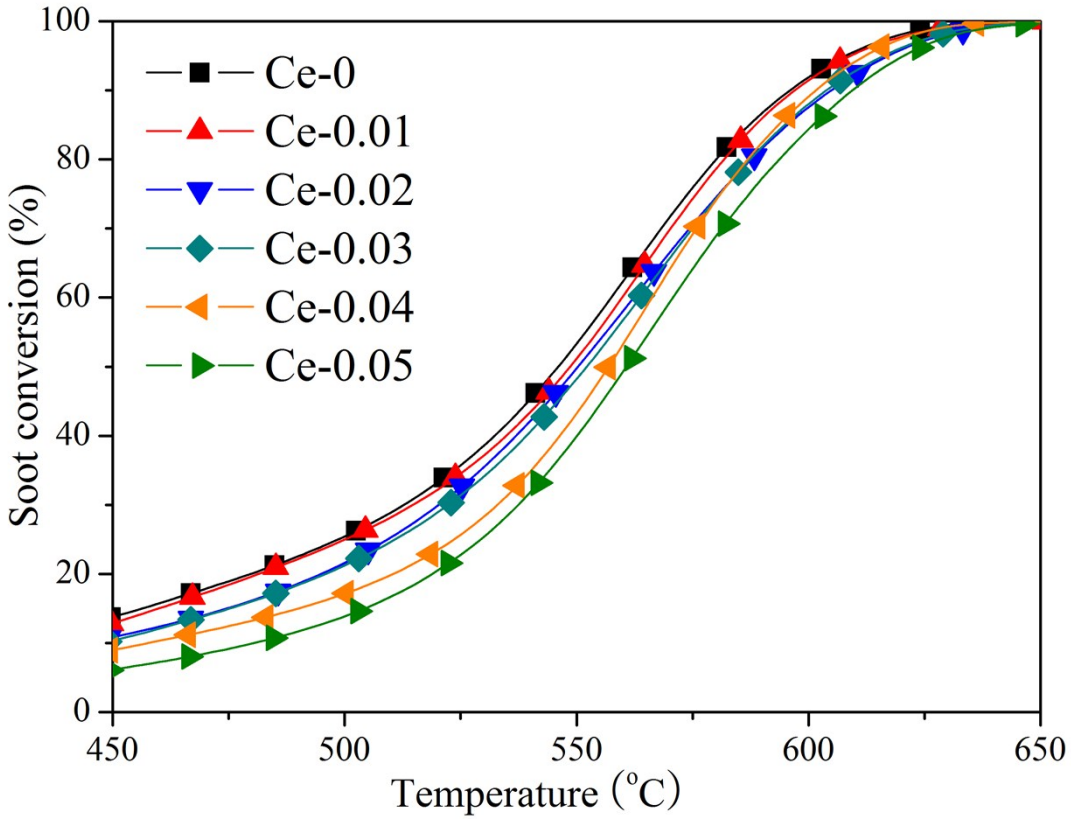

Fig. S2 Soot oxidation activity of the CeO_2 supports. Ce-0, Ce-0.01, Ce-0.02, Ce-0.03, Ce-0.04 and Ce-0.05 are the supports of AgCe-0, AgCe-0.01, AgCe-0.02, AgCe-0.03, AgCe-0.04 and AgCe-0.05, respectively. Reaction conditions: 1% O_2/N_2 (500 mL/min), catalyst/soot = 10/1, loose contact, heating rate = 5 °C/min.

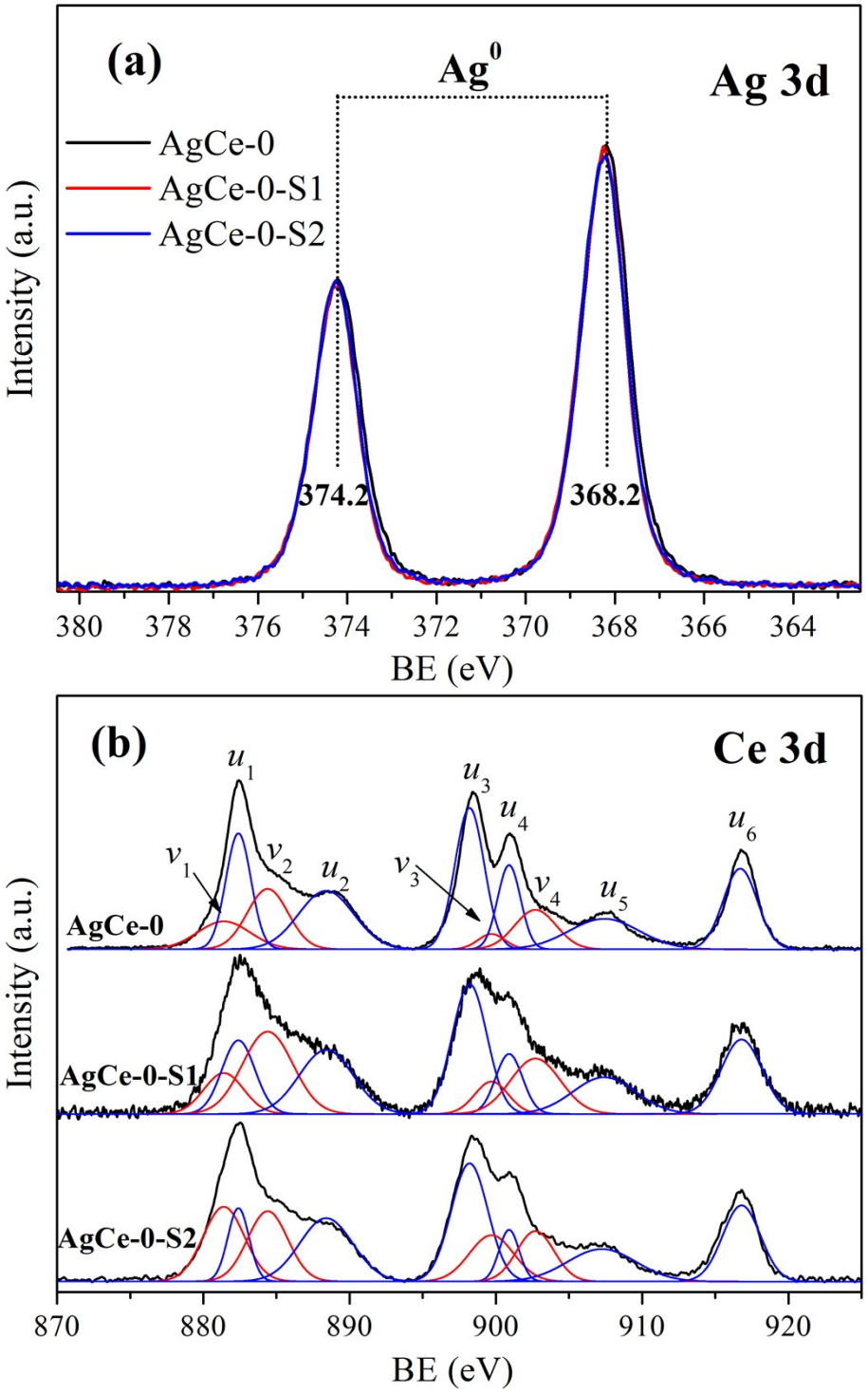

Fig. S3 XPS in the (a) Ag 3d and (b) Ce 4f core level regions of some Ag/CeO_2 catalysts. AgCe-0-S1 refers to AgCe-0 after reaction with soot isothermally at 300 °C for 30 min. AgCe-0-S2 refers to AgCe-0 after soot-TPO up to 600 ºC (heating rate=5 ºC/min). According to this deconvolution, the Ce^{3+}/Ce^{4+} of AgCe-0, AgCe-0-S1 and AgCe-0-S2 are 0.37, 0.55 and 0.64, respectively.

Some explanation for Fig. S3:

As indicated in this figure, for the spent catalysts, although the silver species always maintained their metallic form, these catalysts may still suffer from excessive $V_{O\text{-}s}$ ($Ce^{3+}/Ce^{4+}\geq 0.55$), thus fall into the continuous deactivation region (**Fig. 9b**) and exhibit only deactivation behavior during a new catalytic cycle. In this sense, the used Ag/CeO_2 catalysts can never be as active for soot oxidation as the fresh ones—they will show progressively lower activity in further soot oxidation reactions.

However, it should be noted that, the reaction atmosphere in this work (CGPF simulation, 1% O_2/N_2) is quite different from those of many other studies about soot oxidation catalysts (CDPF/CSF simulation, generally with ≥5 vol.% O_2/N_2, many of which include NO_x). With larger content of gaseous O_2 (5 vol.% or more), the presence of NO_x and higher temperatures (e.g. >650 ºC), ceria-based catalysts can be re-oxidized much more easily than they did in this work [see **A. Setiabudi, et al. *Appl. Catal., B* 51 (2004) 9–19; Y. Gao, et al. *Appl. Catal., B* 203 (2017) 116–126**]. Therefore, although the used catalysts could not be regenerated in the CGPF simulative condition in this study, it is possible for them to be regenerated and exhibit activity similar to the fresh catalysts after several soot-TPO cycles in a CDPF/CSF simulative condition [see **Y. Wei, et al. *Catal. Sci. Technol.* 3 (2013) 2958–2970; Y. Wei, et al. *Small* 9 (2013) 3957–3963**].

Table S1. Quantitative analysis of H_2 consumption in H_2-TPR.

Catalyst	Low-temperature H_2 consumption ($cm^3/g_{cat.}$)	Mono-layers of CeO_2 reduced by H_2
AgCe-0	3.94	1.03
AgCe-0.01	4.14	1.08
AgCe-0.02	4.80	1.11
AgCe-0.03	5.26	1.25
AgCe-0.04	5.51	1.40
AgCe-0.05	6.31	1.46