Supplementary Information for

Facile synthesis of a novel CeO_2/glass bead catalyst with enhanced catalytic oxidation performance

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Detection of OH• radicals for the AO7 degradation

Experimental

Hydrogen peroxide, fast blue BB dye, dimethyl sulfoxide (DMSO), toluene and n-butyl alcohol were directly used without further treatment. DMSO at a concentration of 18 mmol/L with a volume of 20 mL was first mixed with pure ceria, glass bead and CeO_2/glass bead catalyst and labelled with group a, b and c, respectively. Then, 200 μL hydrogen peroxide was added into the above mixture to initiate the reaction. Blank group is defined as just mixing DMSO with hydrogen peroxide without the addition of any solid catalyst. 15 minutes later, 10 mL mixture was taken out from blank group, a, b and c, respectively, and added with fast blue BB dye at a concentration of 15 mmol/L of 2mL. After that, a mixture of toluene and n-butyl alcohol (volume ratio 3:1) was used to extract the abovementioned solution and the supernatant was analyzed by using a UV–vis spectrophotometer three times each group to obtain an average value.

Results and Discussion

Actually, the method employed here base on the previous work [1, 2]. Specifically, dimethyl sulfoxide (DMSO) was used as a molecular probe and oxidized by OH• to form stable methane sulfinic acid, which can be detected and quantified by a UV–vis spectrophotometer. The resulting absorbance (A_{ave}) should increase with the increase of OH• concentration. Particularly, if the absorbance value equals to zero, there are definitely no formation of OH• radicals. The results were listed in Table 1.

Table 1 absorbance results for OH• detection

	blank	group a	group b	group c
A_{01}	0	0.471	0.391	1.236
A_{02}	0	0.470	0.394	1.236
A_{03}	0	0.469	0.394	1.235
A_{ave}	0	0.470	0.393	1.236

Obviously, no OH• radicals were produced in the blank experiment, however, there existed large amounts of OH• radicals once in the presence of CeO_2-H_2O_2, CeO_2-H_2O_2, and CeO_2/glass bead-H_2O_2, respectively. Most importantly, order of magnitude for A_{ave} here is group c > group a >group b, which is consistent with what we observed in Fig. 8 in the manuscript. Namely, the CeO_2/glass beads-H_2O_2 system present the most favorable catalytic performance for the degradation of AO7.

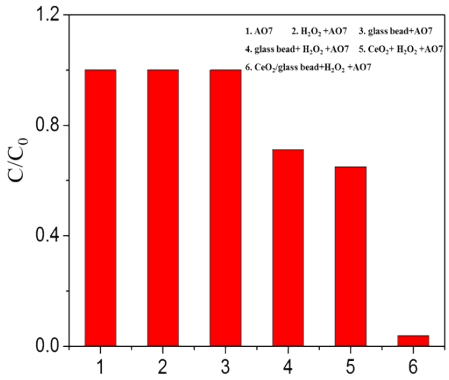

Fig. 8 Comparison of AO7 degradation under different conditions

1. Steiner, M.G. and C.F. Babbs, *quantitation of the hydroxyl radical by reaction with dimethyl-sulfoxide.* Archives of Biochemistry and Biophysics, 1990. **278**(2): p. 478-481.
2. Popham, P.L. and A. Novacky, *use of dimethyl-sulfoxide to detect hydroxyl radical during bacteria-induced hypersensitive reaction.* Plant Physiology, 1991. **96**(4): p. 1157-1160.