Structure-activity relationship of nanostructured ceria for the catalytic generation of hydroxyl radicals

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ELECTRONIC SUPPLEMENTARY INFORMATION

Figure S1. TEM image of commercial ceria particles.

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**Figure S2.** Ce 3d XPS spectra of ceria nanorods (NR), ceria nanocubes (NC), ceria nanoctahedra (NO), and commercial ceria. The spectra were normalized at 882.15 eV. The locations of the Ce$^{3+}$ 3d peaks are indicated by the dashed lines. Note: the similarities between the spectra suggest that these ceria samples have similar % of surface Ce$^{3+}$.

**Figure S3.** Reaction kinetics of catalytic generation of hydroxyl radicals with and without t-butanol as the hydroxyl radical scavenger. Reaction conditions: Reaction temperature: 21.8 °C; [H$_2$O$_2$] = 3 mM; [Ceria NR] = 0.1 g/L; [t-butanol] = 2 M.
Figure S4. Determination of optimum [H$_2$O$_2$] from reaction kinetics for the catalytic generation of hydroxyl radicals from disproportionation of hydrogen peroxide using ceria nanorods. Reaction conditions: 21.8 °C, [H$_2$O$_2$] = 0.1 – 6 mM, [Ceria NR] = 0.1 g/L. The solid line was drawn to guide the eye on the trend line of the apparent reaction rate at higher [H$_2$O$_2$].

Figure S5. Reaction kinetics for the catalytic generation of hydroxyl radicals from disproportionation of hydrogen peroxide using ceria nanorods. (inset) Log-Log plot of the kinetics data for determining the reaction order with respect to the concentration of ceria nanorod catalysts. Reaction conditions: Reaction temperature: 21.8 °C; [H$_2$O$_2$] = 3 mM; [Ceria NR] = 0.1, 0.5, and 1.0 g/L.