Electronic Supplementary Material (ESI) for Nanoscale.
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Supplementary information for

Hydrophilic CeO_2 Nanocubes Protect Pancreatic β-cell Line INS-1 from H_2O_2-Induced Oxidative Stress

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Table S1 The amount of various adsorbed species (N_2, acetate or coating proteins) on the surface of the CeO_2 NCs from the BET and TGA results.

Sample	Adsorbed species		
	N_2 (m^2/g)	Acetate (mg/g)	Protein (mg/g)
CeO_2-5 NCs	133	6.7	267
CeO_2-25 NCs	38	2.3	98
Ratio	3.5	2.9	2.7

Table S2 Catalytic performance of CeO_2 NCs before and after incubation with RPMI-1640 + 10% FBS for 24 h.

Sample	BET surface area / $m^2 \cdot g^{-1}$	Specific reaction rate at 37 °C		TOF at 37 °C /s^{-1}
		per unit weight of catalyst / $mmol \cdot h^{-1} \cdot g^{-1}$	per unit surface area / $mmol \cdot h^{-1} \cdot m^{-2}$	
CeO_2-5 NCs	133	25	0.19	2.3×10^{-2}
CeO_2-25 NCs	38	5.5	0.14	1.8×10^{-2}
FBS coated CeO_2-5 NCs	/	2.0	0.015	1.8×10^{-3}
FBS coated CeO_2-25 NCs	/	3.0	0.080	9.7×10^{-3}

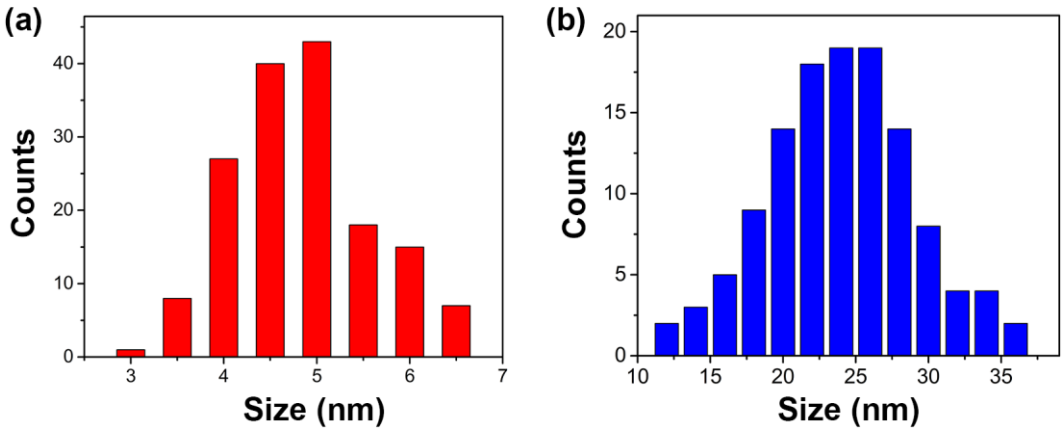

Fig. S1 Size distribution of the as-prepared small-sized CeO_2-5 NCs (a) and large-sized CeO_2-25 NCs (b).

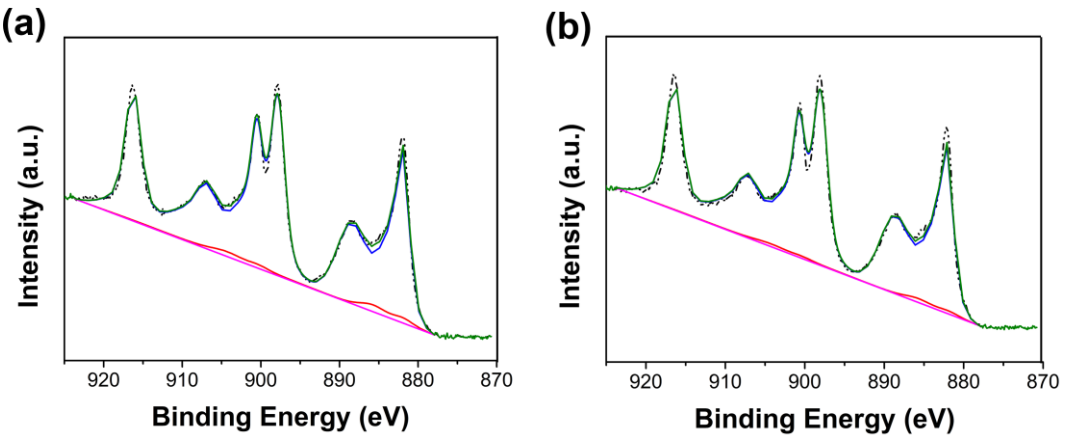

Fig. S2 (a) Ce 3d spectra of CeO_2-5 (a) and CeO_2-25 NCs (b) fitted as the linear combination of Ce(III) and Ce(IV) 3d spectra by the previously reported method (Ref. S1, S2). (Black dots: experimental data; olive line: fitted data; blue line: fitting curve for Ce(IV); red line: fitting curve for Ce(III); magenta line: background).

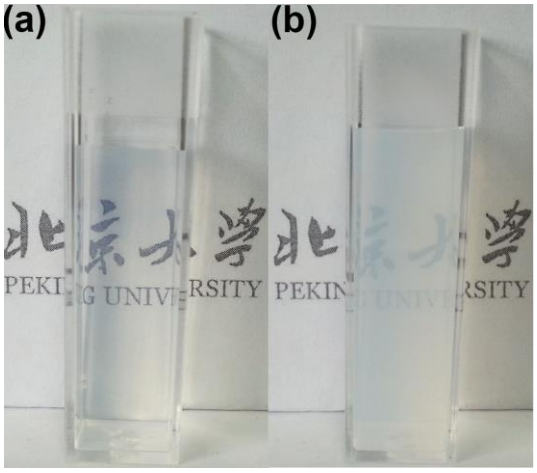

Fig. S3 Colloid solutions of CeO_2-5 (a) and CeO_2-25 NCs (b) redispersed in water (2 mg/mL).

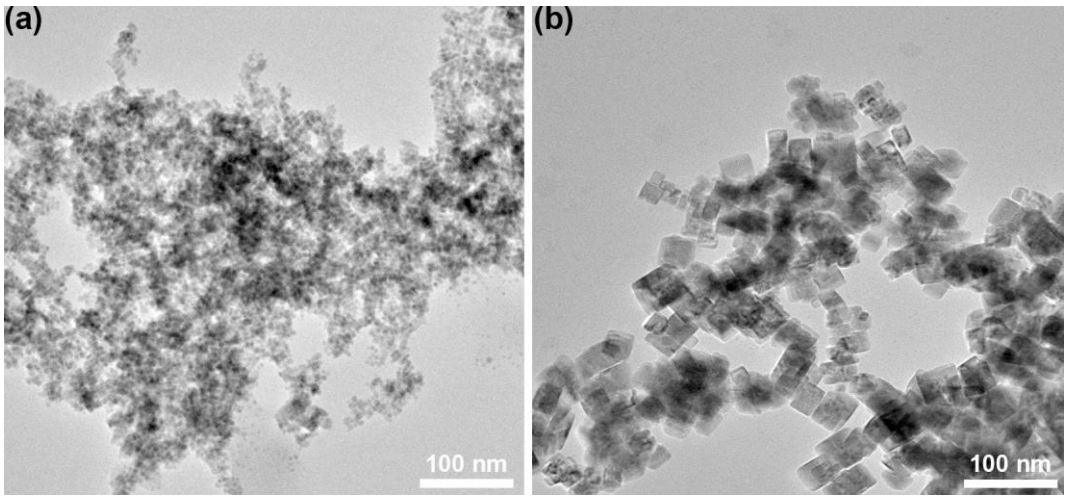

Fig. S4 TEM images of the nanoceria-protein corona conjugates formed from the CeO_2-5 (a) and the CeO_2-25 (b).

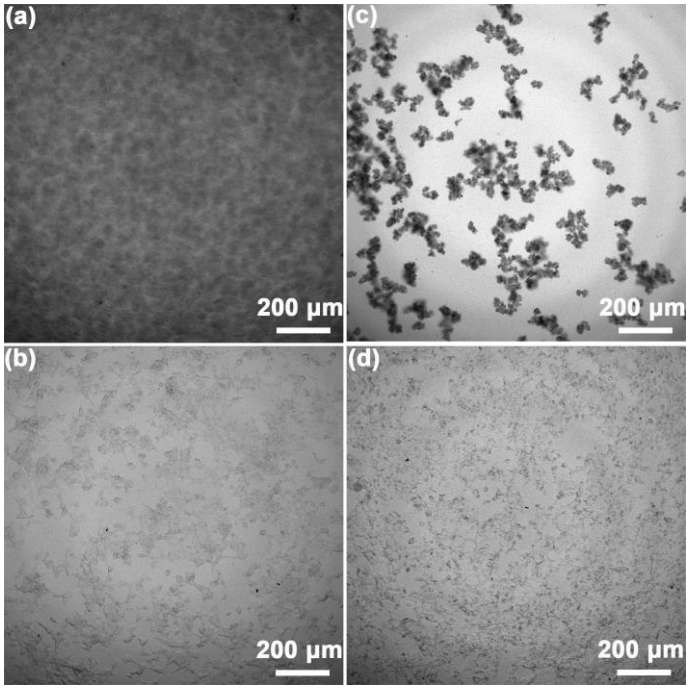

Fig. S5 Confocal bright field images of the agglomerate state of CeO_2-5 NCs in RPMI 1640 medium (a) and RPMI 1640 medium + 10% FBS (b); CeO_2-25 NCs in RPMI 1640 medium (c) and RPMI 1640 medium + 10% FBS (d). INS-1 cells were seeded and incubated for 24 h prior to the addition of CeO_2 NCs solution. The adhesive cells were used as the reference. In addition, the results exhibited that the exposing CeO_2 NCs have no conspicuous effect on cell morphology and growth.

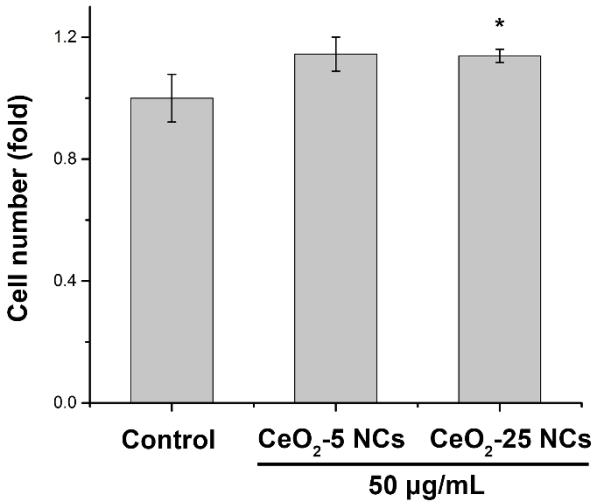

Fig. S6 Cell number of INS-1 cells exposed to 50 µg/mL CeO_2-5 NCs or CeO_2-25 NCs compared to cells exposed to medium only. *p < 0.05 vs. control group. n = 3. Briefly, INS-1 cells were seeded in 35-mm diameter dishes at a density of 2×10^5 cells/well in 2 mL medium. By referencing the CCK-8 cell viability assay, cells were incubated for 24 h prior to the addition of CeO_2-5 NCs or CeO_2-25 NCs at a representative concentration of 50 µg/mL. Then, the cells number was analyzed by direct cell counting with haemocytometer at 24 h after the addition of nanoceria.

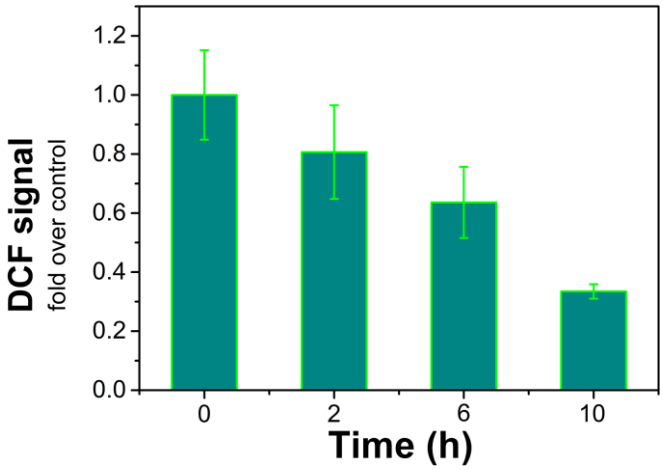

Fig. S7 Intracellular ROS was detected from the DCF signal by flow cytometry with the reported method (Ref. S2). 10,000 cells per sample were acquired after 2, 6 and 10 h exposure to 50 µg/mL CeO_2-5 NCs. Data are presented as the mean fold change in DCF signal compared to medium only ± SD (n = 3).

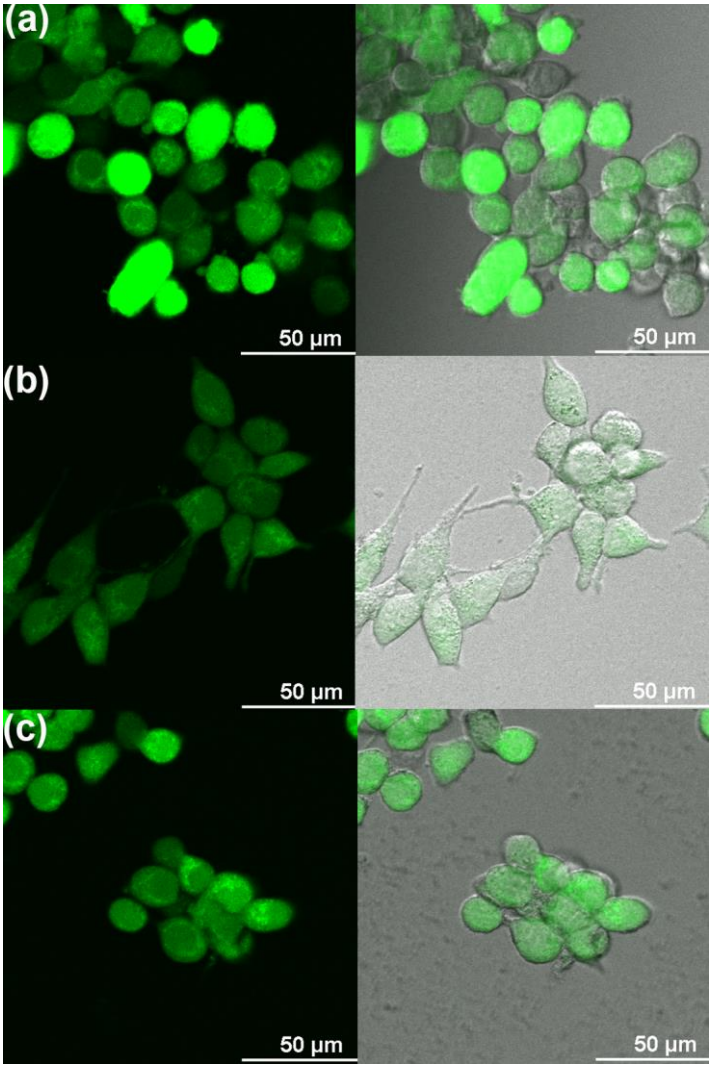

Fig. S8 Representative confocal fluorescent images (left) and merged images (right) with bright field signals of INS-1 cells after staining with DCFH-DA. (a) control, (b) cells preincubated with 100 µg/mL CeO_2-5 NCs, (c) cells preincubated with 100 µg/mL CeO_2-5 NCs.

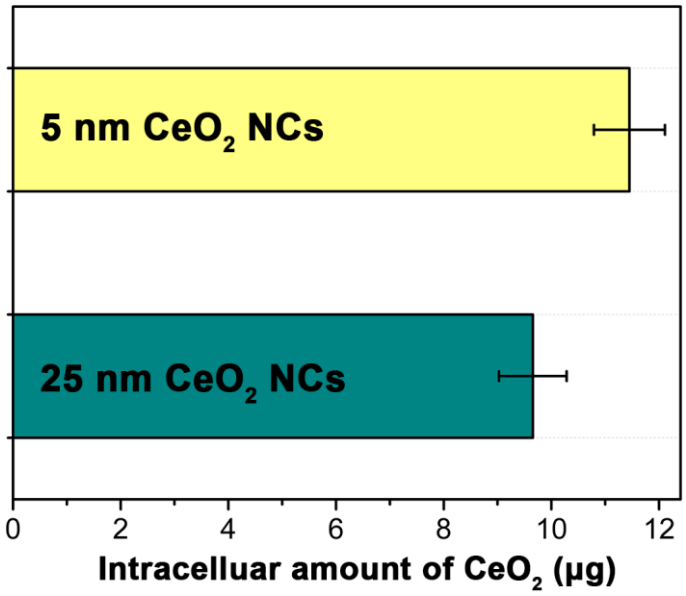

Fig. S9 Quantification of CeO_2-5 and CeO_2-25 NCs internalized by INS-1 cells.

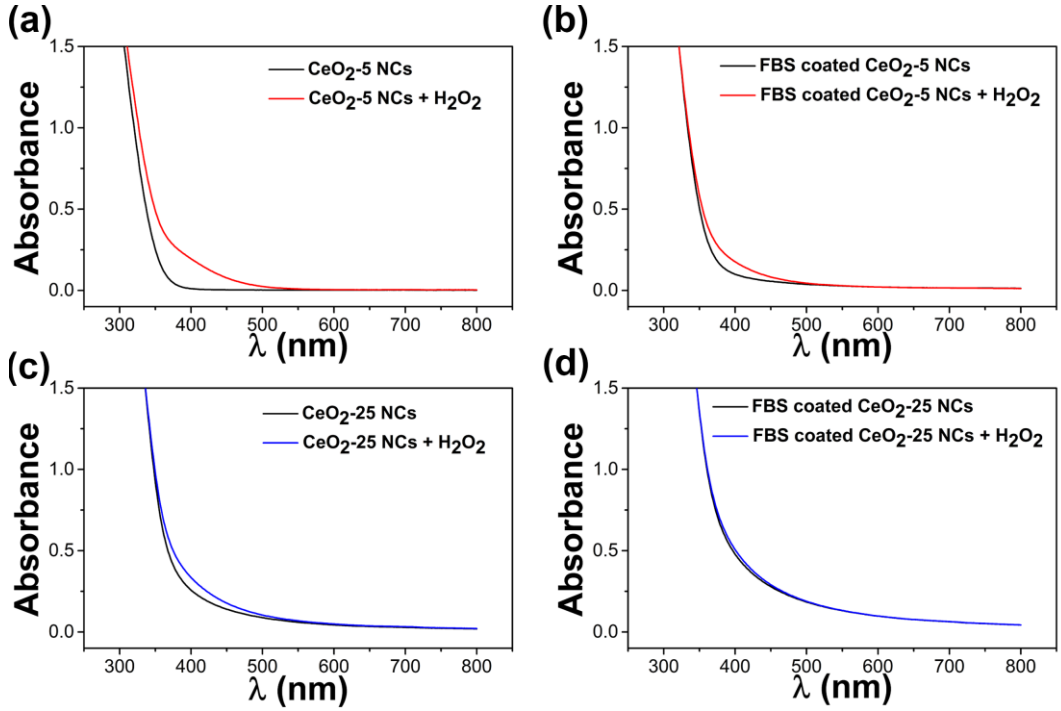

Fig. S10 UV-vis spectra of (a) CeO_2-5 NCs before and after the addition of H_2O_2, (b) CeO_2-5 NCs coated with FBS before and after the addition of H_2O_2, (c) CeO_2-25 NCs before and after the addition of H_2O_2, (d) CeO_2-25 NCs coated with FBS before and after the addition of H_2O_2.

References

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