

Supplemental Information for:

**Poly (acrylic acid)-mediated synthesis of cerium oxide nanoparticles with
tuneable oxidation state and their effect of regulating intracellular ROS level**

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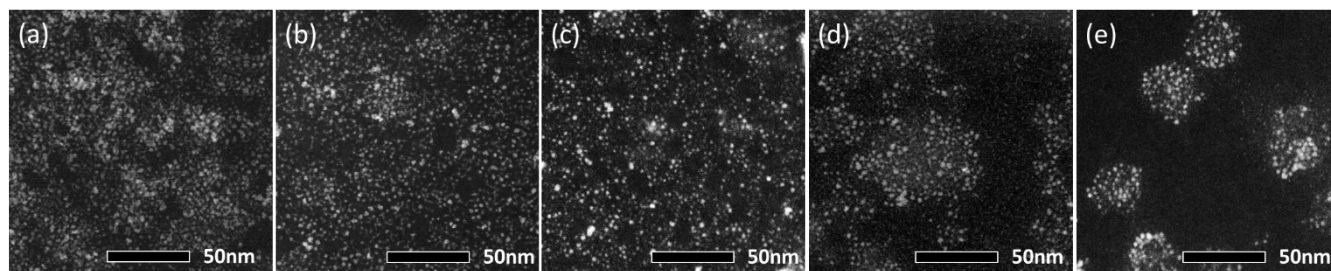


Fig. S1. STEM images of PAA-CeNPs at a lower magnification: (a) PAA-CeNPs-5°C; (b) PAA-CeNPs-25°C; (c) PAA-CeNPs-45°C; (d) PAA-CeNPs-65°C; and (e) PAA-CeNPs-85°C. PAA-CeNPs synthesized under lower temperature (up to 45°C) are monodispersed. PAA-CeNPs synthesized at 65°C and 85°C start to show slight PAA-bridging effect among CeNPs. It is more clear in the sample of PAA-CeNPs-85°C, where agglomeration in the size of 30 nm can be seen (e).

Table S1. Calculation for the number of PAA per CeNPs

Sample name	Ce element (%) ^a	Ce ³⁺ (%) ^b	x (CeO _x)	CeO _x (%)	PAA (%)	PAA-CeNPs No. CeNPs (m)	PAA-CeNPs No. PAA (n)	No. PAA per CeNPs
PAA-CeNPs-5°C	53.3	19	1.91	64.9	35.1	2.1E+16	1.1E+17	8.2
PAA-CeNPs-25°C	52.5	22	1.89	63.8	36.2	2.1E+16	1.1E+17	8.6
PAA-CeNPs-45°C	50.0	30	1.85	60.6	39.4	2.0E+16	1.2E+17	9.9
PAA-CeNPs-65°C	46.8	34	1.83	56.6	43.4	1.9E+16	1.3E+17	11.7
PAA-CeNPs-85°C	45.4	37	1.82	54.8	45.2	1.8E+16	1.4E+17	12.5

Footnote: ^a Measured by ICP-MS. ^b Measured by XPS.

Calculation steps for No. PAA per CeNPs:

Assume all CeNPs has a core size of 2 nm:

Surface area of one nanoparticle = $4\pi r^2 = 12.6 \text{ nm}^2$

Volume of one nanoparticle = $\frac{4}{3} \pi r^3 = 4.2 \text{ nm}^3$

Density of ceria = 7.22 g cm^{-3}

For 1 mg ml^{-1} CeNPs, assume that the CeO_x concentration is m%,

the number of CeNPs = $(m/100) (\text{mg ml}^{-1}) / (7.22 \text{ g cm}^{-3}) / (4.2 \text{ nm}^3) * 6.02 \times 10^{23} = (3.3*m) \text{ E}+16$

For 1 mg ml^{-1} CeNPs, assume that the PAA concentration is n%,

the number of PAA chains = $(n/100) (\text{mg ml}^{-1}) / 1200 \text{ g mol}^{-1} * 6.02 \times 10^{23} = (5*n) \text{ E}+17$

No. PAA per CeNPs = $(5*n) \text{ E}+17 / (3.3*m) \text{ E}+16 = 15.1 * (n/m)$

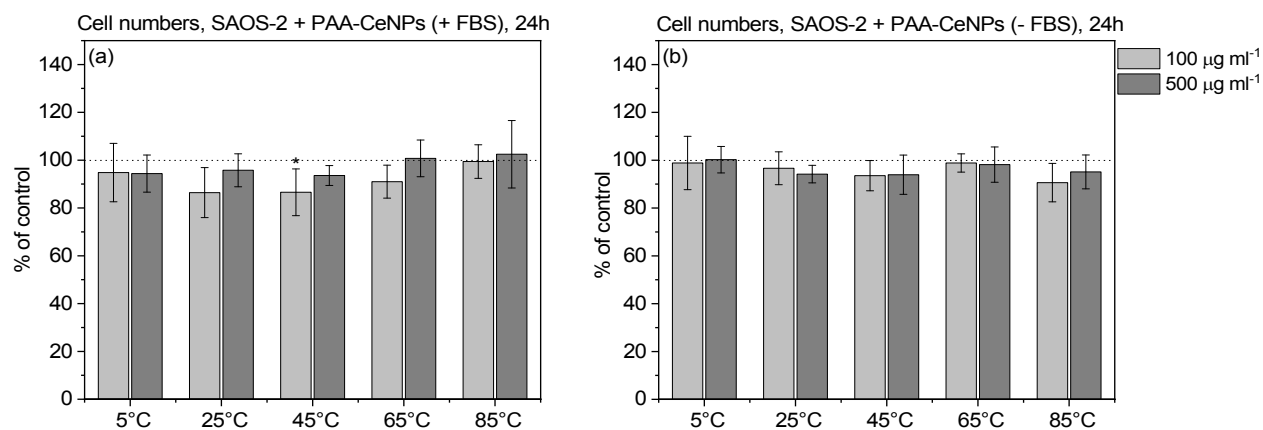


Fig S2. Cell number of SAOS-2 incubated with PAA-CeNPs synthesized at different temperatures (5, 25, 45, 65, and 85 °C) under (a) standard (+ FBS), and (b) non-standard (- FBS) conditions. Cell numbers were represented by DNA content measured by CyQUANT NF Cell Proliferation Assay Kit. Relative values are expressed as a percentage of the control sample (untreated cells in adequate cultivation medium). The star symbol (*) highlighted a significant difference from the control sample (Wilcoxon matched-pairs test, $p < 0.05$). The dotted line shows 100% control.