Electronic Supplementary Material (ESI) for Environmental Science: Nano.

Table S1. Surface chemistry correlation with catalytic activity

Surface Chemistry and size of the particles	Coating/possible surface contamination	Model/Cell line/Study Design	Comments	Reference
Ce3+ 40%; 3-5nm	bare	Cytochrome C oxidation assay	Higher Ce3+ particles showed higher SOD activity	(Korsvik, Patil et al. 2007)
Ce3+ 20%; 5-8nm	bare	Cytochrome C oxidation assay	Minimal or no SOD activity	(Korsvik, Patil et al. 2007)
Ce3+- 28%; 3-5nm	bare	Degradation of H_2O_2	Minimal or no catalase mimetic activity	(Pirmohamed, Dowding et al. 2010)
Ce3+- 6%; 5-8nm	bare	Degradation of H_2O_2	Good catalase mimetic activity	(Pirmohamed, Dowding et al. 2010)
Ce3+ - 30.4%, 5-10nm	hexamethylenetetramine	Methyl violet photometric assay	Smaller size and higher Ce3+ have higher hydroxyl radical scavenging activity	(Xue, Luan et al. 2011)
Ce3+ - 20.9%, 15-20nm	hexamethylenetetramine	Methyl violet photometric assay	Bigger size and less Ce3+ decrease the efficacy of hydroxyl radical scavenging activity	(Xue, Luan et al. 2011)
Ce3+ -75%, 5-8nm	bare	copper-fluorescein method	No nitric oxide radical scavenging activity	(Dowding, Dosani et al. 2012)
Ce3+ -20%, 3-8nm	bare	copper-fluorescein method	Have nitric oxide radical scavenging activity	(Dowding, Dosani et al. 2012)
Ce3+ -75%, 5-8nm;	bare	Peroxynitrite Decay using fluorescent probe and	accelerate the decay of peroxynitrite; independent of	(Dowding, Seal et al. 2013)

		UV-vis spectroscopy	oxidation state	
Ce3+ -20%, 3-8nm	bare	Peroxynitrite Decay using fluorescent probe and UV-vis spectroscopy	accelerate the decay of peroxynitrite; independent of oxidation state	(Dowding, Seal et al. 2013)
Ce3+- ~ 59%, 3-5nm	Bare or PEG	Cell free buffer system	Interact highly with phosphate ions in buffer and significant change catalytic activity such as SOD, catalase mimetic activity	(McCormack, Mendez et al. 2014)
Ce3+ <30%; 3-5nm	Bare or Dextran	Cell free buffer system	Less interaction with phosphate ions and minimum change in towards SOD or catalase acticity	(McCormack, Mendez et al. 2014)
Ce3+ -57%; 3-5nm; +ve surface chrge	bare	HUVEC cell line and CAM assay	Increase in tube formation and lowering oxidative stress markers (HO-1 or TrxR1)	(Das, Singh et al. 2012)
Ce3+ -27%; 3-5nm	bare	HUVEC cell line and CAM assay	Increase in tube formation; not in extent to higher Ce3+ nanoparticles	(Das, Singh et al. 2012)
Ce3+ -28%; 6-8nm; +ve surface charge	bare	L3.6pl (pancreatic cancer cell) or hTERT-HPNE (normal pancreatic cells), *in vivo* model of pancreatic tumor	two folds increase in radiation induced ROS in L3.6pl, whereas decrease in hTERT-HPNE pretreated with nanoceria	(Wason, Colon et al. 2012)
Ce3+ -21%; 3-5nm	dextran	Normal (HDFs), melanoma (A357) cell line, in vivo	50% decrease in melanoma cell viability, no significant decrease in	(Alili, Sack et al. 2012)

		xenograft model	normal HDFs cells, significant decrease in tumor volume	
Ce3+ 57%; 3-5nm; +ve surface charge	bare	Normal Human dermal fibroblasts (HDFs), melanoma (A357) cell line	~20% decrease in melanoma cell viability	(Alili, Sack et al. 2012)
Low Ce3+; 5-8nm; negative (-43.10mV), near neutral (-16.26mV) and positive (+45.01mV) particles	Transferrin	A549 airway cells	Nanoceria with negative (-43.10mV) to near neutral (-16.26mV) zeta potential were readily taken by the as compared to the positive (+45.01mV) particles	(Vincent, Babu et al. 2009)
Dextran coated nanoparticles (DNC)-14nm, neutral surface charge; Poly(acrylic acid) coated nanoparticles (PNC) – 5nm, +ve surface charge; Aminated poly(acrylic acid) (ANC)-5nm, -ve surface charge	PNC, ANC, DNC	lung carcinoma (A549), cardiac myocytes (H9c2), human embryonic kidney (HEK293), and breast carcinoma (MCF-7)	PNC and ANC coated nanoparicles localized in lysosome for A549 and showed reduction in cell viability; DNC localized in cytoplasm and no tixocity towards A549; ANC localized in lysosome as well as cytoplasm for H9c2 and showed some toxicity, where as DNC and PNC localized mostly in cytoplasm and therefore did not affect the cell viability	(Asati, Santra et al. 2010)
Ce3+ -21%; 3-5nm	dextran	Normal Human	Induce ROS generation in	(Alili, Sack et al. 2011)

		dermal fibroblasts (HDFs), squamous carcinoma cell line (SCL-1)	SCL-1, no significant difference in HDFs; inhibit tumor stroma interaction	
Ce3+ -21%; 5-8nm	*N*,*N*,*N*′,*N*′-tetramethylethylenediamine	Nanoceria loaded scaffold, Murine-derived cardiac stem cells (CSCs) and mesenchymal stem cells (MSCs)	better cellular attachment and overall cell density	(Mandoli, Pagliari et al. 2010)
Ce3+ -6, 10, 18, 21%; 5-8nm	*N*,*N*,*N*′,*N*′-tetramethylethylenediamine	human tumor monocytes (U937), human tumor T lymphocytes (Jurkat cells)	Reduction in scavenging ROS and anti-apoptotic property by decreasing the Ce3+ on the surface	(Celardo, De Nicola et al. 2011)
Ce3+ -56%, 3-5nm; +ve surface charge	bare	HUVEC	No phosphatase or catalase activity, have SOD mimetic activity, less cell internalization, no significant decrease in cell viability or slight decrease in intracellular ATP	(Dowding, Das et al. 2013)
Ce3+ -27%, 5-8nm; +ve surface charge	bare	Cell free buffer system, HUVEC	Have phosphatase (Vmax - 0.017nmol/min), nitric oxide radical radical scavenging and catalase activity, no SOD mimetic activity, higher less cell internalization, significant	(Dowding, Das et al. 2013)

			decrease in cell viability or intracellular ATP	

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