Towards the development of antioxidant cerium oxide nanoparticles for biomedical applications: controlling the properties by tuning synthesis conditions.

Noemi Gallucci,1,2 Giuseppe Vitiello,2,3*, Rocco Di Girolamo,4 Paola Imbimbo,1 Daria Maria Monti,1 Oreste Tarallo,1 Alessandro Vergara,1 Irene Russo Krauss,1,2 Luigi Paduano 1,2,*

1 Department of Chemical Sciences, University of Naples Federico II, 80126 Naples, Italy
2 CSGI, Center for Colloid and Surface Science, 50019 Sesto Fiorentino (FI), Italy
3 Department of Chemical, Materials and Production Engineering, University of Naples Federico II, 80125 Naples, Italy
* Giuseppe Vitiello, Email: giuseppe.vitiello@unina.it
Luigi Paduano, Email: lpaduano@unina.it

Evaluation of NP concentration

Ce concentration in nanoparticles samples was determined by ICP-MS in terms of mg/kg concentration. Considering a CeO₂ density of 7.6 g/cm³ and the volume of NP core as experimentally determined by TEM images it was possible to estimate the weight of a single nanoparticle being 10⁻¹⁹ g, corresponding to a nanoparticle molecular weight of about 299545.6 g/mol. We thus converted Ce concentration into NP molar concentration and used this value to determine the oleylamine and sodium oleate concentration needed for coating [1-2].
Figure S1. Raman spectra for the three CeO$_2$ samples: Green CeO$_2$ OC$_{150}$ ($\nu=464$ cm$^{-1}$; $\Delta \nu=20$ cm$^{-1}$), Blue CeO$_2$ OL$_{150}$ ($\nu=465$ cm$^{-1}$; $\Delta \nu=20$ cm$^{-1}$), Red CeO$_2$ OL$_{250}$, ($\nu=461$ cm$^{-1}$; $\Delta \nu=23$ cm$^{-1}$).

Figure S2. Hydrodynamic radius distribution of CeO$_2$ OL$_{250}$ NPs functionalized with a constant amount of sodium oleate at first day after preparation.
Figure S3. Hydrodynamic radius distribution over time of sample NPs:NaOl molar ratio 1:(2.1x10^6).

References

1. Luchini, A.; Gerelli, Y.; Fragneto, G.; Nylander, T.; Palsson, G. K.; Appavou, M. S.; Paduano, L. Neutron reflectometry reveals the interaction between functionalized SPIONs and the surface of lipid bilayers. Colloids Surf. B 2017, 151, 76-87.

2. Russo Krauss, I.; Picariello, A.; Vitiello, G.; De Santis, A.; Koutsioubas, A.; Houston, J. E.; Fragneto, G.; Paduano, L. Interaction with human serum proteins reveals biocompatibility of phosphocholine-functionalized SPIONs and formation of albumin-decorated nanoparticles. Langmuir 2020, 36, 8777-8791.