Ex-vivo antioxidant yttrium oxide nanoagents

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Reactive oxygen species (ROS) portray highly oxidant components generated in biological or natural environment, implying a myriad of physiological and pathological processes, leading to inflammation, cell signal transduction, and neurodegenerative diseases.[1] Among these species, highly active hydroxyl radicals (●OH), exhibits strong oxidizing properties, inducing potential DNA damage, protein carbonylation, and lipid peroxidation, causing a variety of health problems, including cancer, aging and chronic inflammations.[2,3] Thus, preventing the generation of ●OH radicals is vital. Ceria nanoparticles are widely explored as antioxidants for preventing ●OH radicals due to their unique redox properties and general biocompatibility.[4] Therefore, here we provide a novel choice for antioxidant agent based on yttrium oxide nanocrystals with cubic structure and $Ia\bar{3}$ spatial group. Performing wet chemical methodologies, yttrium oxide nanocrystals with sizes <50 nm in the shape of nanotriangles, nanohearts and self-assembled nanodiscs, were synthesized. We highlight the influence of their shapes on the antioxidant properties, along with *ex-vivo* trials. Additionally, the doping of yttrium oxide nanocrystals with lanthanide ions (Er^{3+}, Yb^{3+}), was investigated as a route towards the generation of a more efficient antioxidant agent. The performance of these yttrium oxide agents are comparable with those of highly explored ceria nanoparticles.[4]

References

[1] *Nature* **2012**, *481*, 278.
[2] *Angew. Chem. Int. Ed*., **2010**, *49*, 4800.
[3] *J. Am. Chem. Soc*., **2010**, *132*, 3668.
[4] *Nanoscale* **2019**, *11*, 4552.

Figures

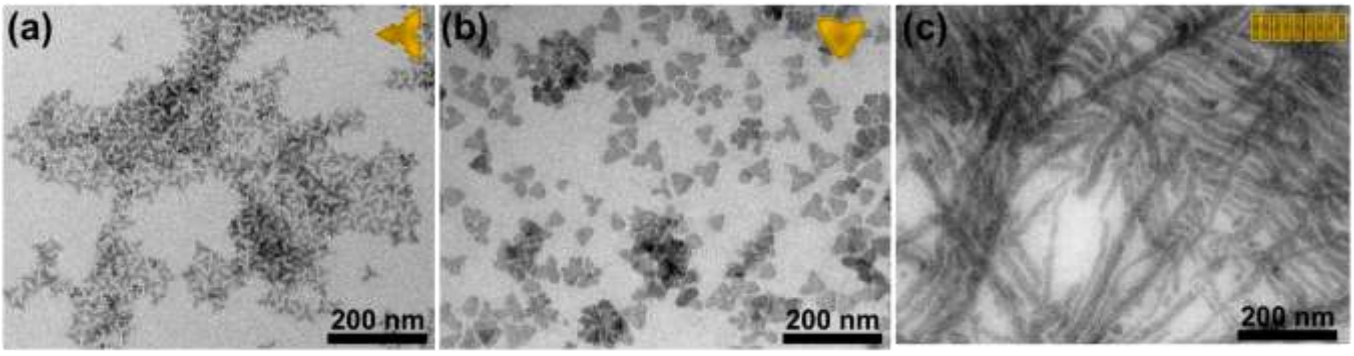

Figure 1. Transmission electron microscopy images of different shapes of yttrium oxide nanocrystals: (a) nanotriangles, (b) nanohearts, and (c) self-assembled nanodiscs, synthesized via wet chemical methodologies.