Polycrystalline Cerium Oxide Nanoparticles

Thanks to researchers at UCF, it is now possible to create ceria nanoparticles (CNPs) with greater than 80% of cerium in the 3+ oxidation state and agglomerated larger nanoparticles with an ordered super octahedral structure for biomedical, catalytic, and planarization applications in which the predominant oxidation state of cerium is trivalent. CNPs have the ability to switch oxidation states between +IV and 25 +III depending on the ambient (oxidizing and reducing) environment. This provides nanoceria with important biomedical properties, including radical quenching.

Applications
In conjunction with the benefits of nanotechnology, CNPs have found numerous applications in catalysis, sensors, and biomedical science with potential use in the prevention of diseases caused by reactive oxygen species (ROS) (e.g. free radicals), including arthritis, inflammation, macular degeneration, neuronal protection, radiation damage, tumors, and cancers. Not only do the CNPs protect cells against the ROS, but they also protect the normal cells against radiation damage.

Technical Details
These nanoparticles are made by dissolving cerium nitrate in a solvent selected from low molecular chain polar solvents and water, adding hydrogen peroxide to the cerium oxide solution until the solution changes to a dark yellowish color, and aging the solution at pH between 1.0 and 4.5 until its color changes to light yellow or colorless.

UCF Inventors
Sudipta Seal, Ph.D.; Satyanarayana Kuchibhalta, Ph.D.

See related technology “A Nano-ceria based Regenerative Radical Sensor,” ID# 30949

Benefits
• Greater than 80% of cerium in the 3+ oxidation state

Applications
• Catalysis
• Sensors
• Biomedical science

Tech Fields
Nanotechnology, Therapeutics

Keywords
ceria nanoparticles, oxidation, super octahedral structure, catalysis, sensors, biomedical science, nanoceria