Sealed Mesoporous Silica Nanoreactors for Accurate X-Ray Dosimetry and Nanochemistry Applications

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CONTACT

Michael M. Mueller

mmmueller@ucdavis.edu

tel: .

OTHER INFORMATION

KEYWORDS

dose enhancement, energy deposition, fiducial probe, mesoporous silica, nanochemistry, nanoreactor, radiation measurement, radiotherapy calibration, sealed nanoparticles, X-ray dosimetry

CATEGORIZED AS

- **Biotechnology**
  - Health
- **Materials & Chemicals**
  - Nanomaterials
- **Medical**
  - Diagnostics
  - Imaging
- **Nanotechnology**

ABSTRACT

Researchers at the University of California, Davis have developed a novel nanotechnology platform that uses sealed mesoporous silica nanoreactors to accurately measure X-ray doses and dose enhancement factors in complex environments. These nanoreactors encapsulate chemical probe molecules inside sealed cavities, enabling precise, interference-free measurements even in the presence of catalysts, scavengers, or other reactive species.

FULL DESCRIPTION

Conventional X-ray dosimetry methods often fail in environments containing nanoparticles or radical scavengers because these external factors distort chemical probe reactions. This invention solves that problem by enclosing probe molecules within hollow mesoporous silica shells and sealing them with a protective layer. X-rays penetrate the shell, generating hydroxyl radicals inside the cavity, which react with the probes to produce fluorescent signals for dose measurement.

The technology provides a reliable, scalable, and versatile approach for fiducial X-ray dosimetry, enabling accurate measurements in environments where conventional methods fail. It also opens new possibilities for studying nanoscale energy deposition and chemical enhancement effects in X-ray nanochemistry, with potential applications in healthcare, materials science, and radiation safety.

APPLICATIONS

- Accurate X-ray dose measurement in medical imaging and radiation therapy.
- Calibration of radiation equipment and dosimetry standards.
- Research in X-ray nanochemistry and energy deposition studies.
- Development of nanoparticle-based cancer therapies.
- Quality control in industrial X-ray processing and sterilization.
- Radiation safety monitoring in nuclear and aerospace environments.

FEATURES/BENEFITS

- Interference-free measurements – isolates probes from external catalysts and scavengers.
- High accuracy and reliability – enables fiducial X-ray dose determination.
- Versatile formats – works in dry form, in solution, or embedded in other materials.
- Customizable design – geometry and size tailored for specific applications.
- Compatible with standard detection systems – fluorescence-based readout.
- Supports advanced research – ideal for studying dose enhancement and nanochemistry.

PATENT STATUS

Country	Type	Number	Dated	Case
United States Of America	Published Application	2021038218	12/09/2021	2019-095

- Materials
- NanoBio

RELATED CASES

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University of California, Davis
Technology Transfer Office
1 Shields Avenue, Mrak Hall 4th Floor,
Tel: 530.754.8649
techtransfer@ucdavis.edu

Davis,CA 95616

https://research.ucdavis.edu/technology-transfer/

Fax:
530.754.7620