Combined Individual Nanomaterial Enhancements for Total X-Ray Enhancement

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ABSTRACT

Researchers at the University of California, Davis have developed a method to combine individual nanomaterial enhancements to achieve greater X-ray enhancement.

FULL DESCRIPTION

Nanomaterials have been used to enhance the effects of X-rays by either physical (increasing the absorption and the subsequent release of electrons from the material) or chemical (improving the catalytic functionality of gold nanoparticles driven by OH radicals produced by X-ray irradiation of water) means. Currently, there is no way to use the methods collectively and it is not known whether there is any advantage of using them together. Unless special care is given to isolate and maximize the enhancement, individual enhancements interfere with each other and create a total X-ray enhancement that is generally lower than the individual enhancement. Therefore, there is a need to develop methods to combine individual nanomaterial enhancements to produce higher total X-ray enhancement.

Researchers at the University of California, Davis have discovered a method to combine individual nanomaterial enhancements to create a higher total X-ray enhancement. When properly combined, the enhancements use less nanomaterial and allow for varied arrangements of nanomaterials at different locations. Multiple X-ray sources can potentially be used to achieve even greater X-ray enhancement. In cancer therapy the 100 keV X-ray source can be a source located outside the body and the low energy X-ray source can be a catheter planted near the cancer site. Both sources may deliver low doses of X-rays. Researchers were able to show that a mixture of physical and chemical enhancement to nanomaterials showed an 18.0-fold enhancement versus 5.5-fold and 2.0-fold enhancement individually. This means a lower radiation dose is required to achieve a similar effect and the arrangement allows for more focused radiation.

APPLICATIONS

- Improved total X-ray enhancement

FEATURES/BENEFITS

- Higher total X-ray enhancement
- Lower required radiation dose
- Greater x-ray radiation localization and efficiency
- Less nanomaterial needed
- Ability to re-arrange nanomaterial
- Ability to use multiple X-ray sources

PATENT STATUS

Country	Type	Number	Dated	Case
United States Of America	Issued Patent	11,452,983	09/27/2022	2015-766

INVENTORS
- Guo, Ting

OTHER INFORMATION

KEYWORDS

nanomaterials, chemical, physical, synergy, radiation, radiation therapy, X-ray therapy, X-ray enhancement

CATEGORIZED AS

- **Imaging**
  - Medical
- **Materials & Chemicals**
  - Nanomaterials
- **Medical**
  - Imaging
- **Nanotechnology**
  - Materials
  - Tools and Devices
- **Sensors & Instrumentation**
  - Other

RELATED CASES

2015-766-0

ADDITIONAL TECHNOLOGIES BY THESE INVENTORS

- Formation of Polymers on Nanostructures Under X-ray Irradiation
- Nanoparticle Capsules for Magnetically Controlled Color-Changing Materials
- Enhancement of X-Ray Radiation Using Nanomaterials
- X-Ray-Triggered Release of Drugs from Nanoscale Drug Carriers
- Measurement of Nanoscale Physical Enhancement by Materials under X-ray Irradiation

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