Development Of Surface Enhanced Graphene Oxide For Ubiquitous Antibacterial Coatings

Tech ID: 29907 / UC Case 2017-176-0

SUMMARY

UCLA researchers in the Department of Medicine have developed a novel graphene oxide (GO) based material with significantly enhanced antibacterial effects with maximized surface display of carbon radicals.

BACKGROUND

Adhesion of bacteria to surfaces of human tissue, biomaterials and medical devices significantly increases the risk of infection in patients. Graphene oxide (GO) materials have demonstrated antibacterial properties across a spectrum of bacteria. However, the most proximal structure activity relationships that lead to antibacterial effects in GO are still elusive. Moreover, most of the reported GO materials exhibit antibacterial effects of only modest severity. A deeper understanding of the specific functional groups that explain the antibacterial effects of GO is crucial for developing an improved GO formulation to enhance the antibacterial effects for clinically important material surfaces.

INNOVATION

UCLA researchers in the Department of Medicine have developed a novel GO based material with significantly enhanced antibacterial effects. They identified carbon radicals (•C) as the key functionality to GO-induced antibacterial effects. To maximize the surface display of carbon radicals, hydrated GO (hGO) is coated on silicone or glass surfaces with a special method that allows direct contact of carbon radicals with bacterial surfaces. The bacterial killing efficiency exhibited by hGO is of a 10-fold increase over pristine GO. Moreover, the immobilization of the functionalized hGO on glass or silicone surfaces allowed the material to repel antibiotic-resistant bacteria by direct physicochemical interaction and damage to bacterial membranes, which was not seen under traditional resistance mechanisms.

APPLICATIONS

- Medical device coating
- Antibacterial additives to biomaterials
- Biosensors surface coating
- Wound treatment
- Water filtration

ADVANTAGES

- Increased antibacterial efficacy
- Effective against antibiotic-resistant bacteria
- Efficient surface coating

STATE OF DEVELOPMENT

- Proof of principle experiments demonstrated with repelling of antibiotic resistant E. coli by hGO coated glass and silicone catheter surfaces

PATENT STATUS

Country	Type	Number	Dated	Case
United States Of America	Issued Patent	11,981,571	05/14/2024	2017-176
United States Of America	Issued Patent	11,208,330	12/28/2021	2017-176

CONTACT

UCLA Technology Development Group
ncd@tdg.ucla.edu
tel: 310.794.0558.

INVENTORS

- Nel, Andre E.

OTHER INFORMATION

KEYWORDS

coating, antibiotic, antibacterial, sterile, material, medical, graphene, carbon, infection

CATEGORIZED AS

- **Biotechnology**
  - Health
- **Engineering**
  - Engineering
- **Materials & Chemicals**
  - Biological
  - Polymers
- **Medical**
  - Devices
  - Disease: Infectious Diseases
- **Sensors & Instrumentation**
  - Medical

RELATED CASES

2017-176-0

European Patent Office	Published Application	3541184	09/25/2019	2017-176

RELATED MATERIALS

- Li, Ruibin, Nikhita D. Mansukhani, Linda M. Guiney, Zhaoxia Ji, Yichao Zhao, Chong Hyun Chang, Christopher T. French et al. "Identification and optimization of carbon radicals on hydrated graphene oxide for ubiquitous antibacterial coatings." ACS nano 10, no. 12 (2016): 10966-10980.

ADDITIONAL TECHNOLOGIES BY THESE INVENTORS

- Safer-By-Design Doped Pyrogenic Silica Nanoparticles

UCLA Technology Development Group
10889 Wilshire Blvd., Suite 920,Los Angeles,CA 90095
tdg.ucla.edu
Tel: 310.794.0558 | Fax: 310.794.0638 | ncd@tdg.ucla.edu