

FIBRIN HYDROGELS WITH PLASMONIC NANOPARTICLES

ABSTRACT

The invention relates to a photothermal device comprising plasmonic nanoparticles embedded in a hydrogel made of fibrin matrix that in addition may entrap thermosensitive effectors. Irradiation of the device with near infrared (NIR) light of specific wavelength and energy level increases the temperature of the composite. This photothermal device can be implanted and then irradiated on demand, providing a reliable source of heat in biological tissues. Localized photothermia can be used to remotely control the delivery of therapeutic agents from the device. The invention is useful for the application of hyperthermia-based therapies and controlled delivery of therapeutic agents in biological tissues.

This invention was developed by researchers from the University of Zaragoza, Hospital Universitario La Paz, and Biomedical Research Networking Centre in Bioengineering, Biomaterials and Nanomedicine (CIBER-BBN).

www.ciber-bbn.es

DESCRIPTION

Fibrin is a biocompatible, biodegradable and non-immunogenic biomaterial. The features of fibrin matrices are well suited to obtain implantable devices comprising plasmonic nanoparticles tailored for absorption between 600 and 1150 nm. This wavelength range of the NIR spectrum provides a therapeutic window that maximizes light penetrance in biological tissues. The inclusion of plasmonic nanostructures in a fibrin matrix results in a composite which efficiently transduces NIR photon energy into heat. Additionally, the plasmonic composite may entrap thermosensitive effectors as temperature sensitive liposomes or genetically modified cells responsive to temperature increases. NIR irradiation of the photothermal device increases its temperature, resulting in the active release of therapeutic agents contained or produced by the thermosensitive effectors.

The different aspects of the present invention are:

Procedure for obtaining photothermal devices and their use as medicinal products.

Method for generating controlled increase of temperature in a selected anatomical location

Method for controlling the delivery of therapeutic agents in a selected anatomical region.

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APPLICATIONS

Antitumor therapy
Treatment of infections
Tissue regeneration and wound healing.
Pain relief.
Treatment of neurodegenerative disorders.

DEVELOPMENT STATUS

Developed

IP STATUS

Spanish Patent granted

AVAILABLE FOR

- Exclusive license agreement
- Non-exclusive license agreement
- Further research or development

INDUSTRIAL PROPERTY

Spanish Patent **ES 2527800 B1**

TECHNOLOGICAL OFFER

INNOVATIVE ASPECTS AND ADVANTAGES

Source of hyperthermia with therapeutic effect

Controlled Drug Delivery

Confinement of the therapeutic composition in any anatomic site

Repeated photothermal inductions in the target tissue

Reliable, controlled and precise establishment of hyperthermia in depth tissues

Direct destruction of cancer cell in anti-tumor therapeutic protocols

CONTACT DETAILS

e-mail: techoffer@ciber-bbn.es

CIBER-BBN
Instituto de Salud Carlos III
C/ Monforte de Lemos 3-5, pabellón 11
28029 Madrid (SPAIN)

www.ciber-bbn.es

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