Graphene-Coated Substrate for Biomedical Implants

Description:

There is growing demand for advanced coatings to control the interactions between biomedical implants and the surrounding biological environment. For cardiovascular stents specifically, materials such as nitinol, 316L stainless steel are often used in implant manufacturing due to their superior mechanical properties. However, their metallic nature results in poor hemo- and bio-compatibility. Thus, surface coatings are critical to mask any adverse physiological response originating from the stent material. Researchers at Clemson University have demonstrated a graphene coating for cardiovascular stent applications. Graphene exhibits unique properties and has been hailed as a material of the future. The research has effectively demonstrated that molecular coating of graphene on clinical grade nitinol is more bio- and hemo-compatible than uncoated nitinol due to its unique properties to form a smooth layer of atoms and electrochemical interactions with plasma proteins. Notably, the graphene-coated nitinol supports controlled smooth muscle and endothelial cell growth resulting in natural cell morphology and behavior. These advanced properties, in addition to high durability and chemical inertness, make graphene an ideal material candidate for coating bio-medical implants.

Applications:

- Advanced coating for cardiovascular stents
- Other medical devices

Benefits:

- Increases efficacy and life of a cardiovascular stent
- Reduces protein adsorption
- Reduces thrombosis due to activation of bound proteins on the metal surface
- Reduces inflammation and cell damage
- Prevents corrosion of the metal surface
- Improves the bio- and hemo- compatibility of the traditionally used stent materials
- Utilizes a scalable coating process to create a durable coating
- Reduce rate of revision procedures required post stent implantation

Related Publications:

- Graphene coatings for enhanced hemo-compatibility of nitinol stents RSC Advances. 2012

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Protection Status: Patent application filed
Licensing Status: Available for licensing
CURF Ref No: 2011-117

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