Use of Silver-containing Layers in and on Implant Surfaces

Published date: Oct. 5, 2018

Technology description

Background

Medical devices implanted in the human body can react with internal bio fluids and cause infection or compromise the health of surrounding bone and/or tissue. Treating infections with antibiotics is not always desired because it can be difficult to direct the antibiotic to the specifically needed location, treatment can take between 3 to 14 months to complete, and overuse of antibiotics can cause resistance making this a less attractive option in some cases. Coating medical implants can increase the biocompatibility of the devices and can also improve the functionality of the implant when features such as friction reduction and

the encouragement of new bone growth is desired. Coating implants with metals (such as silver) also offers the option of infusing the devices with customizable antimicrobial functionality that inhibits, prevents, or reduces bacterial infections associated with inserting implants. This invention describes a versatile method for selectively infusing and topically coating medical devices with micro layers that improve antimicrobial functionality and enhance other physical properties as needed for individual applications. Orthopedic implants made of titanium are primarily described, but the technology can be used to coat other implant structures. Mixtures and composites using silver are primarily described, but other metals such as gold, platinum, copper, and zinc can also be used and are also known to have effective antimicrobial properties.

Market Opportunity

The medical implants market is expected to grow in the areas of orthopedics, cardiovascular, spinal, neurostimulators, ophthalmic, dental, breast, and facial implants. Orthopedic implants will grow because of increasing obesity, a rise in osteoporosisrelated fractures, and increased consumer awareness about the benefits of how orthopedic surgeries improve quality of life.

Advantages

Sputtering deposition is the process that is primarily used to coat the medical devices highlighted in this disclosure. Sputtering allows easy control of film thickness layers, delivers excellent adhesion to a variety of substrate materials, and allows customizable application of coating materials when selective application is needed. This process also allows the silver-containing coating materials to be applied at

room temperature which is well below the 300 oC deposition temperature that is typically required to apply silver onto metal substrates. This option improves the operating economics of the process and also expands the type of implant materials that can be used (including plastics which would otherwise melt if the higher temperature was required). Glass coatings and "diamond-like carbon" coatings can also be applied using the sputtering deposition process whether or not silver is used. These alternate coating materials can also improve the biocompatibility of implant devices and can also selectively enhance the hardness of implant devices. Electron beam vapor deposition is an alternative process that can be used in the same manner as sputtering.

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