Knowledge Transfer Office
香港城市大學
City University of Hong Kong

Medical Implant with Controllable Electro-Mechanical Interactions at a Material/Bacteria Interface

Manufacturing

Nanotechnology and New Materials

IP Status
Patent filed

Technology Readiness Level (TRL) 3

Opportunity

The market for implantable medical devices continues to grow worldwide. However, the use of such devices is complicated by a high risk of associated infection, which can lead to systemic infection or device malfunction. Various leaching and non-leaching antibacterial coatings have been explored; however, leaching coatings can cause toxicity or require replenishment to remain effective. Non-leaching options that depend on physical interactions between the device material and infectious pathogens are thus an appealing option. A material that can be implanted without toxicity and can effectively eliminate (rather than merely reduce) pathogens is needed.

Technology

Researchers have invented a non-leaching antibacterial titanium coating material that relies on physical contact to kill bacteria. Titanium dioxide nanowires extend from the coating such that they exert electrical and/or mechanical forces on the bilayer membranes of bacterial cells, thus disrupting the cells. The nanowires can further be converted via nitrogen gas treatment to capacitive titanium nitride nanowires, which can be controlled remotely to adjust the angle and thus optimize the antibacterial efficacy of the material. In vivo and in vitro experiments demonstrated the ability of these nanowires to kill bacteria by both physically piercing the bilayer membranes and triggering electron transfer at the membrane interface.

Advantages

- Non-leaching material reduces the risk of in-vivo toxicity
- Coating does not need to be reapplied or replenished
- Adaptable to a wide range of medical implant devices
- Controllable nanowires enable the antibacterial property to be tuned

Applications

- Medical materials
- Implanted medical devices
- Artificial joints

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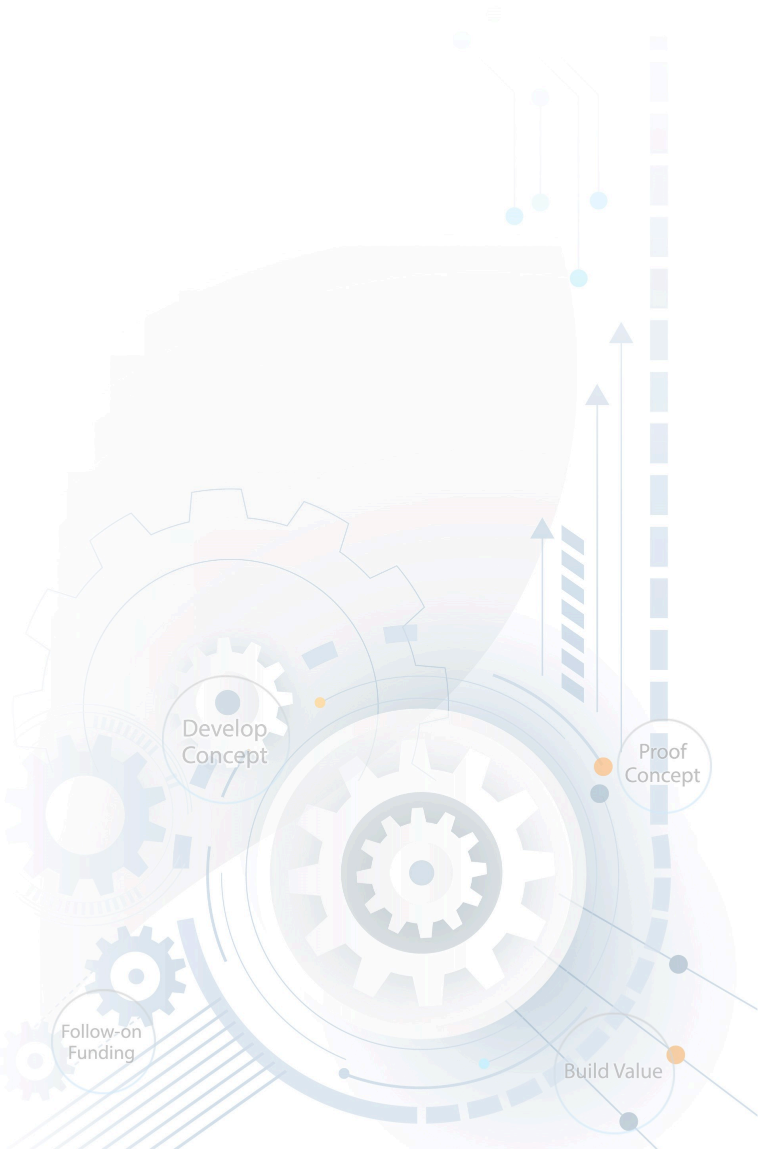
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Proof Concept
Build Value
Follow-on Funding