Remote-Controlled Microscale 3D Self-Assembly

Technology #20170283

Microwave energy triggers self-assembly of microscale structures

A novel self-assembly process uses remote-controlled microwave energy to create microscale, self-assembled three-dimensional (3D) structures. The structures are fabricated with a nanometer scale coating of chromium (Cr), on top of which lie polymer photoresist hinges. When Cr absorbs microwaves energy, the polymer hinges melt and reform, thus driving self-assembly. Varying the Cr thickness alters the folding rates and configurations, so more complex shapes can be obtained from a single microwave energy source. Since microwave energy does not harm living organs or tissues, this technology is well-suited for biomedical applications such as in vivo medical robots, drug delivery systems, stents and biosensors.

Remote initiation of self-assembly

Microscale three-dimensional (3D) self-assembly is currently driven by external heat sources or environmental changes that require direct contact with the structure. These methods are difficult to control. They are not suitable for applications where the microscale structures need to be assembled in a restricted area or the human body. This new technology, which does not require direct physical contact with a heat source or chemicals, can achieve microscale actuations in a remote location.

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Phase of Development

• Proof of Concept

Benefits

• Scalable self-assembly process
• Controllable folding rates and configurations
• Can be assembled in restricted areas or in the human body

Features

• Remote-controlled microwave energy creates microscale, self-assembled 3D structures
• Chromium film absorbs microwaves to generate heat energy that drives self-assembly
• Microwaves remotely actuated, no additional chemicals required, no harm to the body
• Micro-structures offer desirable sizes for in vivo medical robots and drug delivery

Applications

• Medical micro-robots for surgery and tissue sampling
• Drug delivery systems (e.g. nanocarriers, targeted drug delivery technologies)
• Biomedical applications (e.g. stents, cell encapsulation, cell cultures)
• Biosensors (e.g. 3D sensors, 3D inclinometers, blood glucose monitors, bacteria sensor/monitors)
• Electromedical equipment manufacturing

Interested in Licensing?

The University relies on industry partners to scale up technologies for commercial purposes. The license is available for this technology and would be for the sale, manufacture or use of products claimed by the issued patents. Please contact Kevin Nickels to share your business needs and technical interest in this technology and if you are interested in licensing the technology for further research and development.

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Inventors

Jeong-Hyun Cho, PhD
Assistant Professor, Electrical and Computer Engineering

IP: UM Docket 20170283

For additional information, contact

Doug Franz
Technology Licensing Officer
exprlic@umn.edu
612-624-0869