



Remote-Controlled Microscale 3D Self-Assembly

IP Status: Issued US Patent; **Application #:** 10,821,565

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

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

Technology ID

20170283

Category

Engineering & Physical
Sciences/Instrumentation,
Sensors & Controls
Engineering & Physical
Sciences/Robotics
Life Sciences/Medical Devices

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- 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

Researchers

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Publications

[Remotely Controlled Microscale 3D Self-Assembly Using Microwave Energy](#)
Adv. Mater. Technol. , 2017, 2, 1700035

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