

# Surface Nanomodification by Microwave Hydrothermal Treatments

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## Cost and energy efficient method for surface nanomodification for biotechnological applications

Georgia Tech Inventors from the School of Materials Science and Engineering developed a method for surface nanomodification on devices by placing them in an oxidative hydrothermal environment generated by microwave irradiation. This method generates oxidation-formed nanocrystals that partially or completely cover all of the exposed device surfaces. The crystalline places, shapes, and sizes of the surface nanostructure can be easily controlled by the microwave hydrothermal reaction conditions such as the concentration of oxidants in solution, reaction temperature, pressure, irradiation power, and time. Nanostructured features can directly affect the biological response of these devices, making this new method conducive to progression biotechnological innovation.

### Summary Bullets

- **Cost and Energy efficient-** requires shorter times of surface modification with a lower concentration of solvents
- **Less hazardous-** lower concentrations of solvents decrease the negative environmental impact
- **Versatile-** though primarily related to biotechnology, this method can be applied in any industry requiring surface modification

### Solution Advantages

- **Cost and Energy efficient-** requires shorter times of surface modification with a lower concentration of solvents
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### Potential Commercial Applications

- Biotechnology- biosensors, implants, surgical devices, bioreactors
- Metal and ceramic material industrial applications
- Industries requiring specialty surface treatment- automotive, aerospace, power, electronic, biomedical, chemical, construction, etc.

## Background and More Information

Surface modification changes the surface of a material by introducing physical, chemical, or biological characteristics different from the original surface. These modifications are typically made to solid materials in order to bring about a wide range of functional properties. A common method of surface modification is by hydrothermal synthesis. This involves crystallizing substances from high-temperature aqueous solutions at high pressures. Surface nanomodification has potential in the growing biotechnology market but current treatments are limited by cost and material.

## Inventors

- Kenneth Sandhage  
Professor - Georgia Tech Department of Materials Science and Engineering
- Dr. Barbara Boyan  
Professor — Georgia Tech School of Biomedical Engineering
- Rolando Gittens
- Jonathan Vernon

## IP Status

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## Publications

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## Images

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