



## Real Time Bacterial Water Sensors OTT ID # 1225

### Applications

Ultra-sensitive detection of *E. coli* cells for chemical sensors and biosensors.

### Target Problems

*E. coli* 0157:H7 is highly virulent and is infectious with a very low dose such that 10 to 100 CFU can lead to infection. Methods for monitoring this pathogen in food production and water include a culturing and colony counting method, polymerase chain reaction, and immunological methods. These methods have low sensitivity, less specificity, and are time-consuming.

### Key Features

- **Faster** – Rapid response for real-time monitoring of the environment
- **Ultra-sensitive** – Detection of *E. coli* concentrations as low as 10 CFU per mL
- **Scalable** – Fabrication can easily be scaled up with good reproducibility and high electrical stability
- **Inexpensive** – Materials utilized are relatively inexpensive
- **In-situ Detection** – Sensors can be placed directly in a water system for immediate detection

### Technology

The inventor has utilized self-assembly of thermally reduced monolayer graphene oxide (TRMGO) nanosheets on photolithographically patterned gold electrodes for highly sensitive detection of *E. coli* 0157:H7. This fabrication method by a solution process is suitable for mass-production of GO field effect transistor (FET) sensors. The TRMGO FET device shows great electronic stability and high sensitivity to *E. coli* cells with a concentration as low as 10 CFU per milliliter. The inventors have shown that this immunosensor has high sensitivity with a short response time as well as high reproducibility.

### Intellectual Property

[8,268,405](#) Controlled Decoration of Carbon Nanotubes with Aerosol Nanoparticles

[8,240,190](#) Ambient Temperature Gas Sensor

[US9676621B2](#) Graphene-Based Field-Effect Transistor Biosensors

### About the Inventor(s)

[Junhong Chen Ph.D.](#)

### Publications

Chang, et al., [Ultrasonic-assisted self-assembly of monolayer graphene oxide for rapid detection of Escherichia coli bacteria](#), *Nanoscale*, Issue 9, 2013

Mao, et al., "[Specific Protein Detection using Thermally Reduced Graphene Oxide Sheet Decorated with Gold Nanoparticle-antibody Conjugates](#)", *Advanced Materials*, Vol.22, Issue32, August 24, 2010, pp. 3521-3526

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