Institute of Materials Research and Engineering
A*STAR
*A member of A*STAR Research Entities*

Nanomaterials that sense bacteria

The Challenge

Current methods of bacteria detection in water or food samples rely largely on bacteria plate count conducted in a laboratory. This is time-consuming as, typically, a bacteria culture takes 2-7 days to grow. Other commercial methods, e.g. Adenosine Tri-Phosphate (ATP) test, may be faster, but use enzymatic reactions, which are susceptible to changes in temperature and pH.

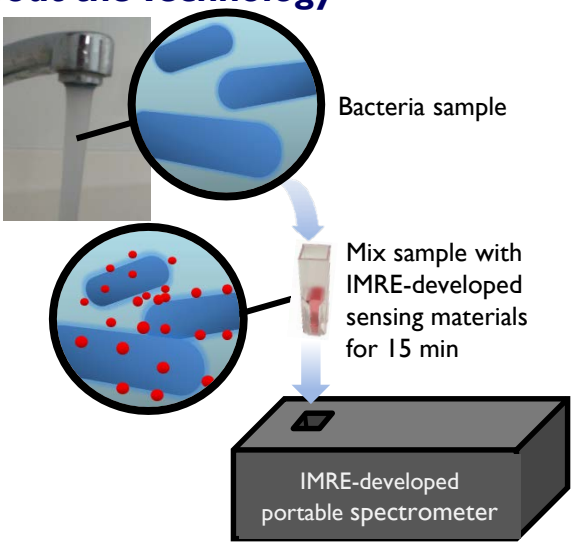
The IMRE Solution

IMRE scientists have developed a nanomaterials-based sensor which addresses the need for more robust bacteria detection that can be carried out on-site in a matter of minutes, instead of days, in a laboratory.

The nanomaterials-based sensor is a solution of charged inorganic nanoparticles and luminescent materials. A total bacteria count in the water or food sample can be obtained by measuring optical changes after mixing the sample with the sensing materials for 15 minutes. The optical changes (absorbance/ fluorescence) can be measured on-site using an IMRE-developed portable spectrometer. This eliminates the need to send samples to the lab and waiting for days for the result.

The higher speed of detection enables industries or authorities to take faster action in preventing bacteria contamination or the spread of pathogens.

About the Technology



Bacteria detection using the IMRE nanomaterials-based sensor and IMRE-developed portable spectrometer

Potential Applications

- Sensors for on-site bacteria count in water or food, which allows for faster analysis and faster mitigating controls to prevent the spread of bacteria or pathogens.

Collaboration Opportunities

- Research and development with industry partners for higher sensitivity sensors to detect even lower levels of bacteria and to detect specific bacteria in water and in air.
- Further development with food and beverage industry partners to detect total bacteria count and specific bacteria in water and more complex sample matrices, e.g. solid food.
- On-site validation of test results and enforcement of quality and safety standards, with authorities or regulatory bodies.

For more information, please contact :
industry@imre.a-star.edu.sg

IMRE website: https://www.a-star.edu.sg/imre/
A*STAR website: https://www.a-star.edu.sg/

Reference No. IMRE-NMA-0002

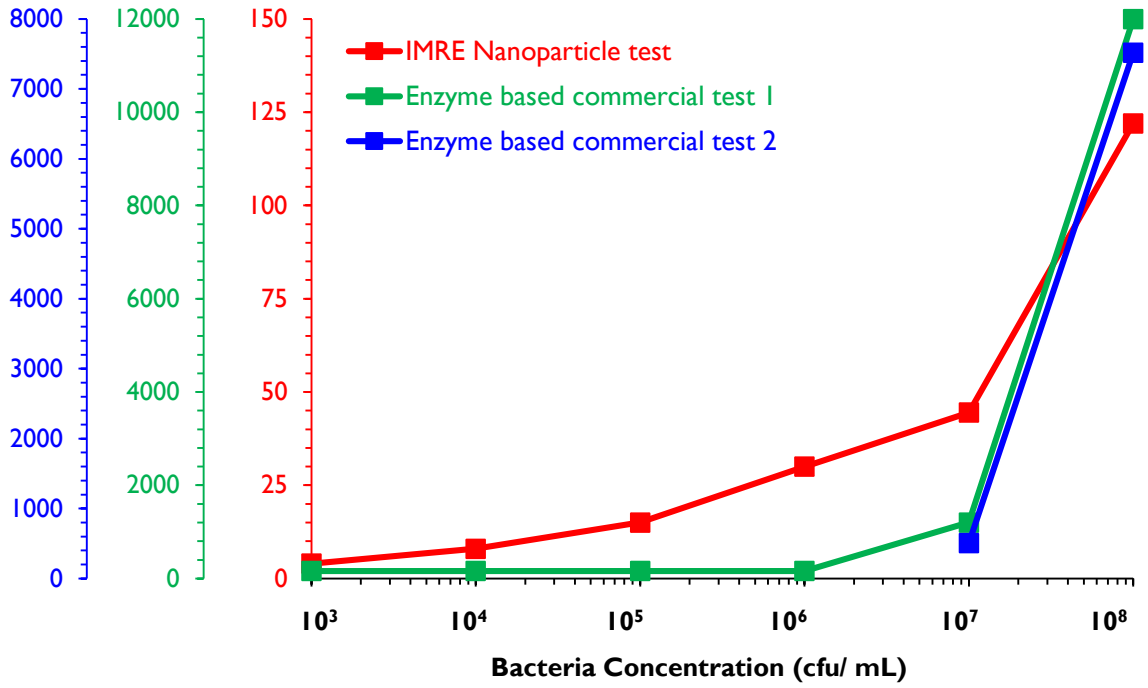
Institute of Materials Research and Engineering
A*STAR

*A member of A*STAR Research Entities*

Nanomaterials that sense bacteria

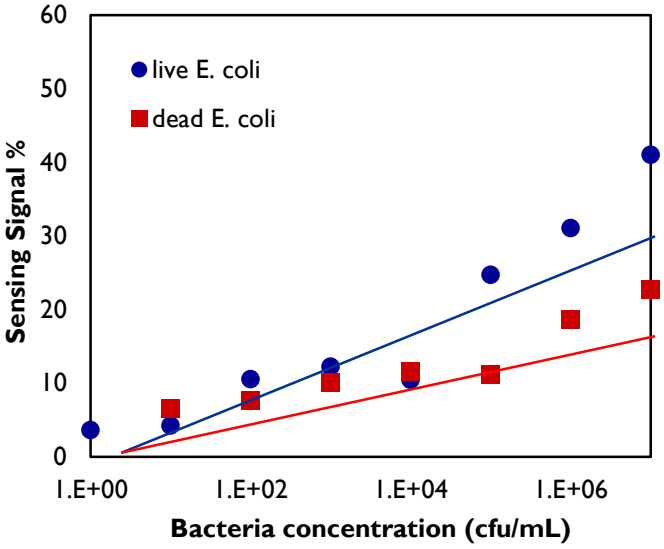
Performance Data

The IMRE-developed nanomaterials-based sensor shows higher sensitivity for bacteria concentrations in the range of 10^4 -10^7 cfu/mL whereas the two enzyme-based commercial assays 1 and 2 do not.



The increase in sensing signal is proportional to live bacteria concentration and helps to differentiate between dead and live bacteria.

Gold Nanoparticle-based Sensor



Graphene Oxide-based Sensor