Graphene field effect transistors for the determination of pH in aqueous environments

Technology #cu15155

Graphene field effect transistors (GFETs) hold exciting potential to be used in the next generation of biosensors as the semiconductor industry moves away from silicon materials. However, conventional GFET biosensors require unreasonably high gate voltages and the use external electrodes that can increase manufacturing cost. This technology is a GFET biosensor for pH measurements that eliminates external electrodes and is capable of operation within aqueous environments. The biosensor can be quickly and inexpensively fabricated using photolithography and does not require the manual assembly of discrete parts. This technology therefore harnesses the sustainable and scalable potential of GFET technology to achieve pH sensing in aqueous environments.

Operation at low gate voltages allows for compatibility with aqueous environments

This technology achieves compatibility with aqueous environments by operating at gate voltages of less than 1.5 volts. Such low gate voltages are due to an embedded gate terminal made from material with a high dielectric constant. The embedded gate further obviates the need for expensive external electrodes, allowing the device to be fabricated using photolithography. The cumulative result is that this technology provides a highly scalable pH sensor made with post-silicon transistor materials capable of operating in aqueous environments.

This technology has been validated and is sensitive over a wide range of pH values, particularly those corresponding to the range of physiological pH.

Lead Inventor:

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Applications:

- Sensors for monitoring of pH in biological systems, from patient derived fluids to cells grown in culture.
- Acidity testing for food and beverage manufacturing.
- Active monitoring of pH in waste management and related industrial processes
- Embedded pH monitors in industrial reactors for monitoring the progress of chemical reactions
- A general platform for the development of other GFETs capable of operating at low gate voltages.

Advantages:

- Compatible with aqueous environments
- Does not require external electrodes,
- Can be manufactured cheaply and quickly via photolithography

Patent Information:

Patent Pending

Tech Ventures Reference: IR CU15155

Related Publications:


Inventors

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