

pH sensor probe for inspecting minute space

pH sensing with a time resolution of 30 ms and a spatial resolution of 250 μm is possible.

Overview

The measurement of pH is critical in environmental analysis. This invention introduces an advanced pH sensor with an outer diameter of just 1 mm, designed for precise measurements in confined spaces.

The core of this invention is a pH sensor probe, integrating a 1-mm square semiconductor chip, known as a Light-addressable Potentiometric Sensor (LAPS). This LAPS is attached to the tip of a uniquely structured fiber with an optical fiber, a conductor, and a hollow flow path. A unique feature of LAPS is its light addressability. Upon exposure to alternating light via the optical fiber, LAPS generates a photocurrent. The amplitude of this photocurrent is directly influenced by localized surface potentials, thereby indicating the localized pH levels. This enables it to perform real-time pH distribution imaging via illumination with multiple lights, each modulated at distinct frequencies.

Furthermore, this sensor is not limited to liquid environments. It is equally adept at measuring the pH on dry surfaces, such as metal and concrete.

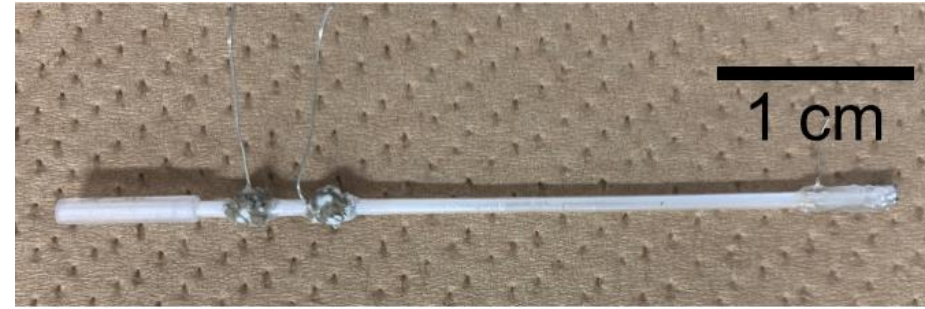
The lower right panel of the application illustrates the sensor's performance in measuring the pH within a rat's deep brain with a high spatial resolution of 250 μm and a rapid frame rate of 33ms.

Product Application

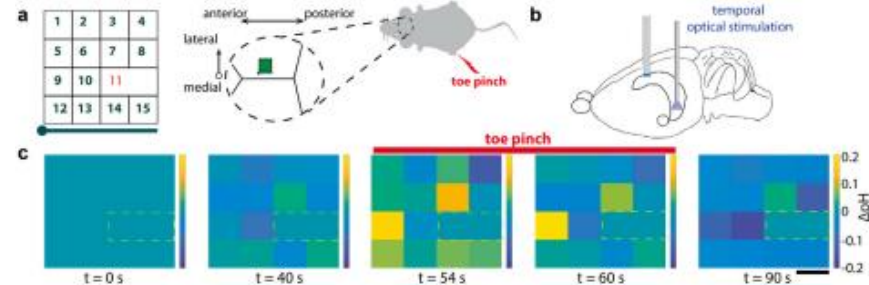
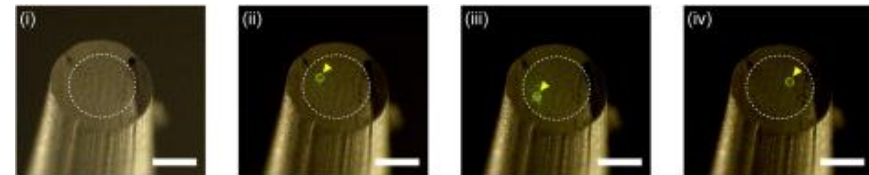
- ❑ Corrosion inspection probe inserted into cracked parts such as metal and concrete
- ❑ Imaging probes that measure neural activity in the deep brain

IP Data

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Features·Outstandings



Related Works

- [1] Tohoku University Research News, 2020, "Eavesdropping on the pH Levels Inside the Brain"
- [2] PLOS ONE 2020, 15, e0228076.
- [3] Biosensors and Bioelectronics 2021, 174, 112870.

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