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Photobase Bound To A Polymer And Photoacid Sensing Water Activity

Tech ID: 34351 / UC Case 2025-759-0

BRIEF DESCRIPTION

A novel polymer-based fluorescent sensor that enables real-time local sensing of water activity at all pH levels with high spatial resolution for use in carbon removal technologies.

FULL DESCRIPTION

This fluorescent sensor technology provides continuous, spatially resolved monitoring of ionic reactions and local water activity in aqueous environments at all pH levels. The sensor exhibits absorbance changes in acidic conditions (pH 2-5) and photoluminescence changes in basic conditions (pH 9-14). The invention involves polymers embedded with photoacids and photobases that reversibly detect water activity at sub-second timescales with approximately 1 μm spatial resolution using confocal fluorescence microscopy. Ultra-thin polymer coatings and covalently bonded photobases overcome the optical diffraction limit, thus enabling high-resolution local sensing of water activity for carbon removal applications.

SUGGESTED USES

- » Electrochemical water and CO2 reduction electrolyzer performance monitoring.
- » Sensors for direct ocean capture of CO2.
- » Environmental monitoring of aqueous protonic species and water activity.
- » Development of advanced sensors for industrial process control involving aqueous solutions.

ADVANTAGES

- » High spatial resolution ($\sim 1\ \mu\text{m}$) three-dimensional sensing of protonic species.
- » Sub-second temporal resolution for real-time monitoring.
- » Overcomes optical diffraction limit through covalent bonding and sub-micron polymer coatings.
- » Broad pH range detection from acidic to basic conditions.
- » Capability to quantify local water activity and pOH in aqueous solutions.

PATENT STATUS

Patent Pending

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OTHER INFORMATION

CATEGORIZED AS

- » **Materials & Chemicals**
 - » Chemicals
 - » Polymers
 - » Thin Films
- » **Sensors & Instrumentation**
 - » Environmental Sensors
 - » Other

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