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Roll-to-Roll Manufacturing of Printed Electrochemical Sensors with Real-Time Imaging & ML for Predictive Analysis

High-throughput printed nitrate sensors with ML-powered image analysis for real-time soil and crop monitoring.

Researchers at Purdue University have developed a new roll-to-roll (R2R) manufacturing process for printing electrochemical sensors with real-time image processing and machine learning capability for predictive analysis. There remains an unmet need, especially for agricultural applications, to detect soil and climate conditions including ion concentration, moisture, pH, and microbial activitiesâ€”to name a few. Purdue researchers have created a highly efficient, low-cost approach to producing nitrate sensors that are made by coating electrodes with an ion-selective membrane (ISM) capable of -50 mV/dec sensitivity with concentrations as low as 6 ppb as tested in lab. In lab testing, a Nernst response of 55 mV/dec was obtained in 10 seconds. The sensors have also been integrated into an internet of things (IoT) network including a low-power wireless communication system for testing across the Wabash Heartland area of Indiana including Tippecanoe and Benton Counties. They have exhibited promise to mitigate negative environmental impact of fertilization and leaching by giving a more accurate estimate of crop health and potential yield through image acquisition and machine learning.

Advantages:

-Highly Efficient

-Highly Selective

-Highly Sensitive

-Compatible with a Wireless IoT Network

-Low-Cost

Potential Applications:

Technology ID

2021-RAHI-69276

Category

Computing/Internet of Things (IoT)
Agriculture, Nutrition, & AgTech/Precision Agriculture & Smart Farming
GreenTech/Water & Resource Management

Authors

Muhammad A Alam
Jan Allebach
Mukerrem Cakmak
Nicholas Glassmaker
Rahim Rahimi
Ali Shakouri
Babak Ziaie

Further information

Patrick Finnerty
pwfinnerty@prf.org

View online

-Agriculture and Crop Management

-Machine Learning

-Electrochemical Sensors

Technology Validation:

This new R2R manufacturing technique for electrochemical sensors was validated with on-site testing throughout the Wabash Heartland area of Indiana in soil testing applications.

Recent Publication:

Wabash Heartland Innovation Network 2019 Report

https://pcrd.purdue.edu/wp-content/uploads/2020/09/WHIN-Report-Sept-2019.pdf

TRL: 4

Intellectual Property:

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