PURDUE INNOVATES | Office of Technology Commercialization

Calibration-free moisture content sensor and related methods

A calibration-free moisture content sensor utilizing electrochemical impedance spectroscopy offers a prompt, reliable, and highly accurate means for real-time moisture content monitoring across multiple industries, requiring minimal to zero calibration.

Researchers at Purdue University have developed a calibration-free moisture content sensor for pharmaceutical applications. By leveraging electrochemical impedance spectroscopy (EIS), this technology enables accurate and rapid testing of moisture content in pharmaceutical materials. Current methods for moisture content measurement of pharmaceutical powders require extensive calibration, which is time-intensive and results in low producibility. The sensor developed by Purdue instead requires minimal to zero calibration and offers a prompt, reliable means for real-time moisture content monitoring. Moreover, applications for the sensor extend beyond pharmaceuticals, offering benefits for the food, energy, environmental, and healthcare industries.

Technology Validation:

By combining the frequency spectrum information, equivalent circuit indices, and material characteristics as inputs, the proposed sensor achieved exceptional predictive accuracy, with an average error as low as 0.69%.

Advantages:

-Facilities a quicker and more accurate moisture content determination

-Requires minimal to zero calibration

-Applicable to a wide range of industries

-Promotes expedited product development

Applications:

-Pharmaceutical powders

Technology ID

2024-LU-70552

Category

Pharmaceuticals/Computational Drug Delivery & Nanomedicine
Biotechnology & Life Sciences/Analytical & Diagnostic Instrumentation

Authors

Yining Feng
Guangshuai Han
Na Lu

Further information

Matt Halladay
MRHalladay@prf.org

Erinn Frank
EEFrank@prf.org

View online

-Moisture content analysis

Publication:

https://pubs.acs.org/doi/abs/10.1021/acssensors.4c01180

TRL: 4

Intellectual Property:

Provisional-Gov. Funding, 2024-08-30, United States

Utility-Gov. Funding, 2025-08-27, United States

Keywords: calibration-free moisture sensor, electrochemical impedance spectroscopy (EIS), pharmaceutical moisture content analysis, real-time moisture monitoring, moisture content sensor for food industry, energy industry moisture sensor, environmental moisture analysis, healthcare moisture sensing, rapid moisture content determination, pharmaceutical powders moisture analysis, 1D convolutional neural network, Computer Technology, Electrochemical Impedance Spectroscopy, equivalent circuit modeling, moisture content analyzer, moisture sensing, Pharmaceuticals