Contribution ID: **72** Type: **Poster**

Towards electronic microplates with multimodal sensing for bioassays

Scientists and clinicians across various disciplines rely on the use of microplates in laboratories and clinical settings. Traditional optical measurement techniques involving cumbersome microplate readers and advanced microscopes offer valuable insights into biological systems. These techniques typically require trained personnel, often limiting their use to dedicated core laboratories. In addition, many bioassays require staining, which increases complexity, and sample processing times. We introduce a novel thermal-based readout method that offers a cost-effective, user-friendly, and real-time alternative to complement the traditional strategies. This new approach has the potential to broaden the accessibility and simplify the bioassay analysis.
Thermal sensors can be seamlessly integrated into standardized microplate formats. The sensing principle relies on the inversely proportional relationship between resistance change and heating power, generated through Joule heating. The so-called modified Transient Plane Source technique is sensitive to changes in the thermal effusivity of the sample, which can be related to changes in biological properties. Additionally, by precisely controlling the power between measurement pulses, we gain the capability to control baseline temperature, providing both incubation and sensing functions with a single thermal element. This added versatility enhances the potential applications of thermal-based readouts in various bioassays. We aim to demonstrate our proof-of-concept using a straightforward and reliable biological system tracking bacterial growth. Yet, our approach extends beyond the integration of thermal sensors into microplates. Our device will be driven by low-power microcontroller-based Arduino UNO R4 WiFi electronics, enabling smartphone controlling, wireless data transmission, and cloud-based storage. The overarching vision is to create a versatile multimodal sensing interface capable of not only controlling the environment but also measuring a range of factors, including thermal bulk properties, electrical bulk properties, and specific biomarkers.

References

Acknowledgement of financial support

Primary author: NIEDER, Daniel (Helmholtz Zentrum Dresden Rossendorf)

Co-authors: CELA, Isli (Institute of Radiopharmaceutical Cancer Research, Helmholtz-Zentrum Dresden-Rossendorf e.V., 01328, Dresden, Germany); BARABAN, Larysa (Institute of Radiopharmaceutical Cancer Research, Helmholtz-Zentrum Dresden-Rossendorf e. V, 01328, Dresden, Germany); JANICIJEVIC, Zeljko (Helmholtz-Zentrum Dresden-Rossendorf e.V., Institute of Radiopharmaceutical Cancer Research)

Presenter: NIEDER, Daniel (Helmholtz Zentrum Dresden Rossendorf)

Session Classification: Life Science & Digital Health