

A Paper-Based Next-Generation Plate-Format Platform for Practical and Scalable Research Applications



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Technology Transfer Brief

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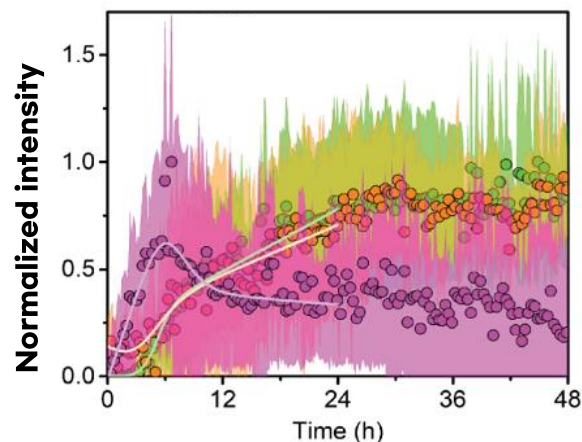
01 Reaction Behavior Is a Spatial Measurement Problem

“Reaction behavior under spatially heterogeneous conditions cannot be fully captured by a single bulk-averaged readout.

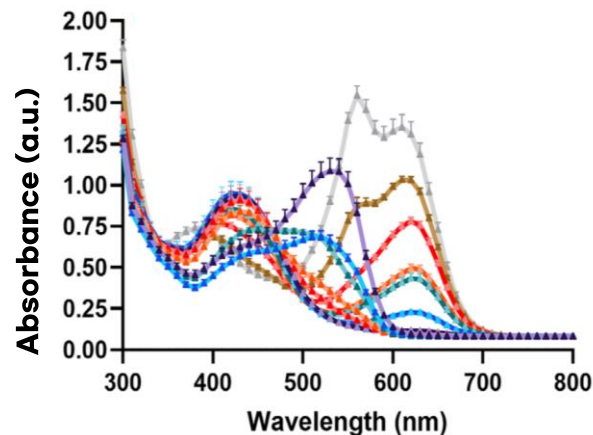
- **Bulk assay limitation** : Under spatially heterogeneous reaction conditions, well-plate measurements collapse complex processes into a **single bulk-averaged signal**.
- **Structural source of ambiguity** : This arises from liquid-filled well plates, where **complex intra-well dynamics** are often reduced to one scalar readout.

- **Probe-dependent** bulk kinetics.
- A single bulk-averaged readout does not reliably represent underlying reaction behavior.

- **Spectral overlap** in bulk wells.
- Bulk well-plate measurements produce overlapping spectral responses that hinder chemical discrimination.



- AN-SP : Aggregation increases slowly.
- taBODIPY : Aggregation increases, then decreases.
- ThT : Aggregation increases.



- pH 1 — pH 4 — pH 7 — pH 10
- pH 2 — pH 5 — pH 8 — pH 11
- pH 3 — pH 6 — pH 9 — pH 12

(*Source: Li *et al.*, ACS Chem. Neurosci., 2024)

(*Source: Lee *et al.*, Small Methods, 2025)



Spatially Resolved Reaction Insight

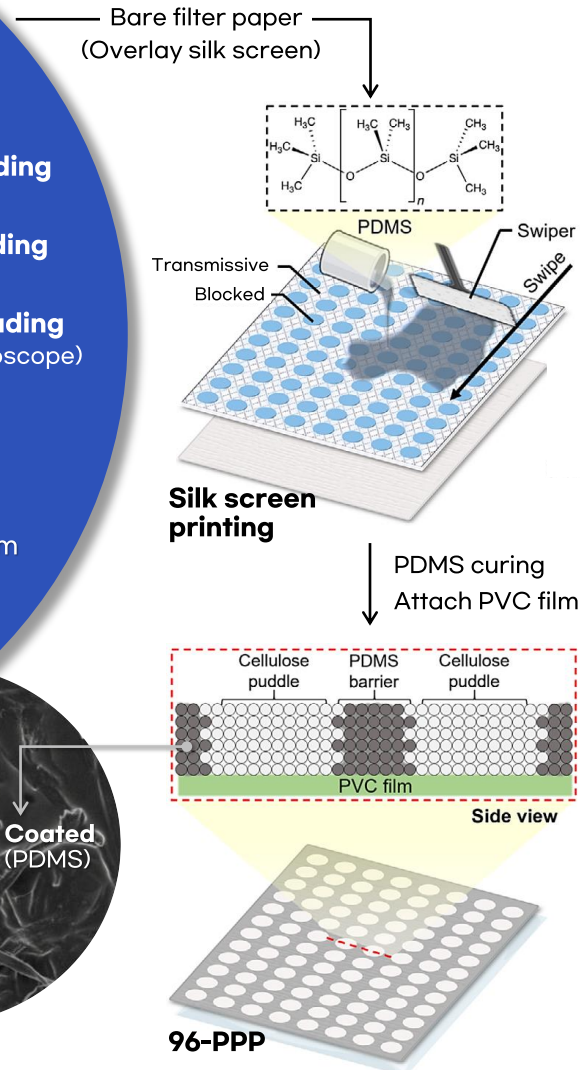
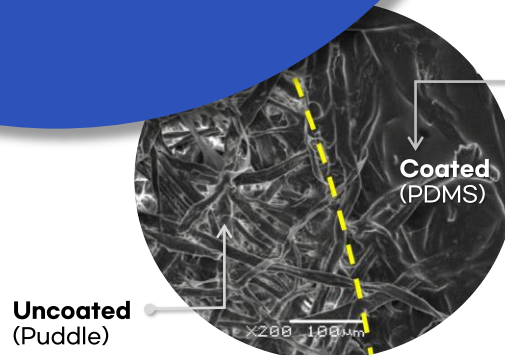
Application-Specific Format Flexibility

02 Technology Overview

96-Puddle Paper Plate (96-PPP)

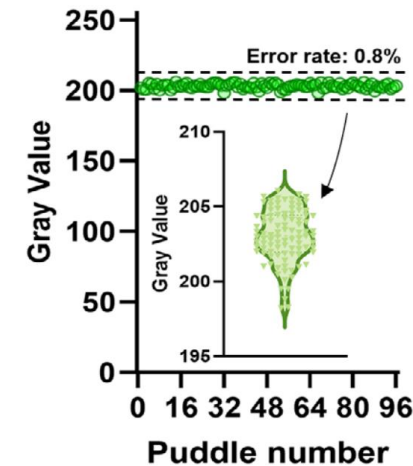
- ① Colorimetric reading (Smartphone)
- ② Absorbance reading (Microplate reader)
- ③ Fluorescence reading (Fluorescence microscope)

- **Lab-on-paper analytical platform** designed to replicate the format and functionality of a standard 96-well plate on a **cellulose substrate**.
- Through silk-screened PDMS patterning, the platform creates leakage-free and uniform puddles that are fully compatible with standard microplate-based analyses.



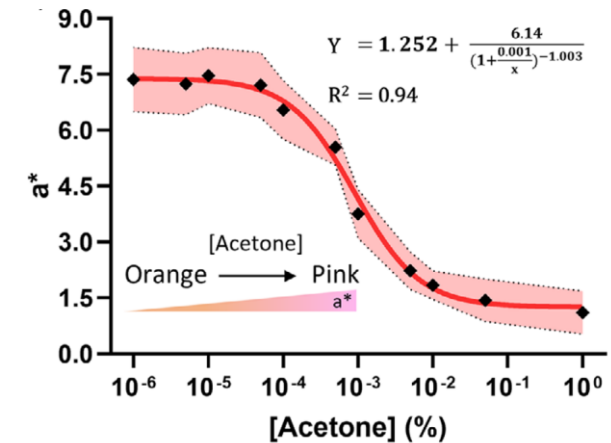
- ✓ Retaining **Spatial Reaction Significance** on a Paper-Based Analytical Platform.
- ✓ Simple fabrication, standard equipment compatibility, and validated reproducibility and quantification enable **commercial practicality**.

① Reproducibility



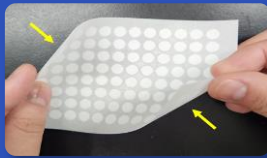
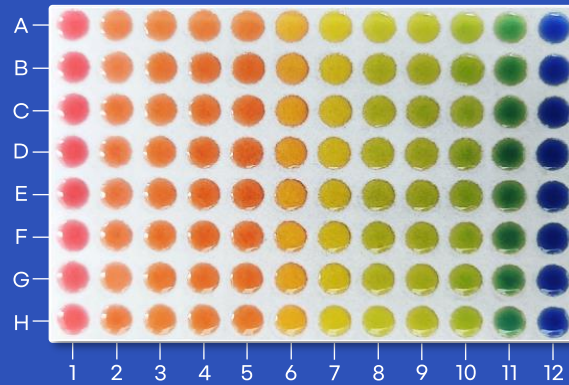
- Low variation across 96 puddles (error : 0.8%).
- High inter-puddle reproducibility.

② Quantification



- Color parameter (a^*) correlates with acetone concentration ($R^2 = 0.94$).
- Enables quantitative colorimetric detection.

02 Technology Overview



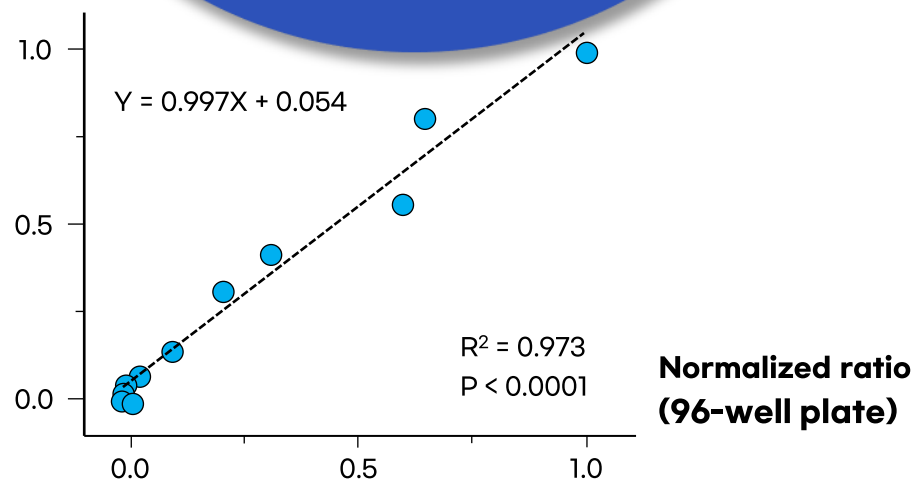
Flexibility,
Storage efficiency



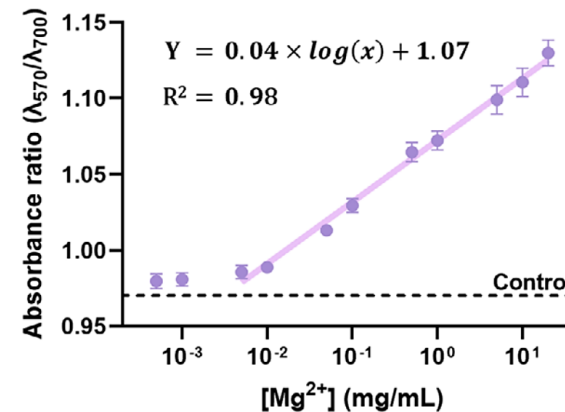
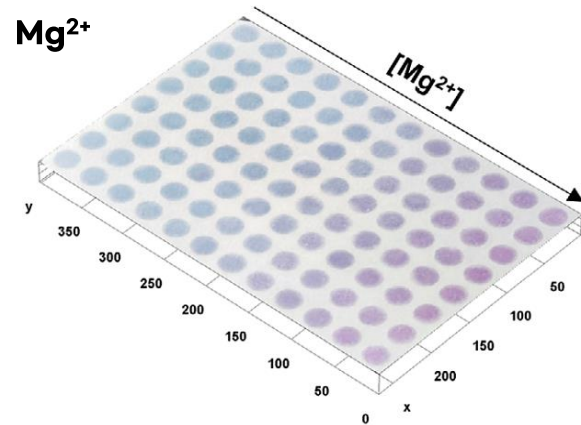
Equipment
compatibility

- ✓ **96-well plate compatibility** : Quantitative agreement with conventional 96-well plate assays.
- ✓ **Versatile applicability** : Applicable to chemically diverse analytes, including ions, small molecules, and metabolites.
(e.g., Mg^{2+} , ascorbic acid, acetoacetate)

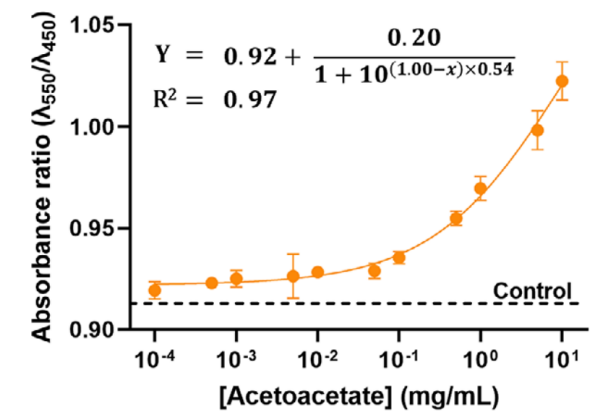
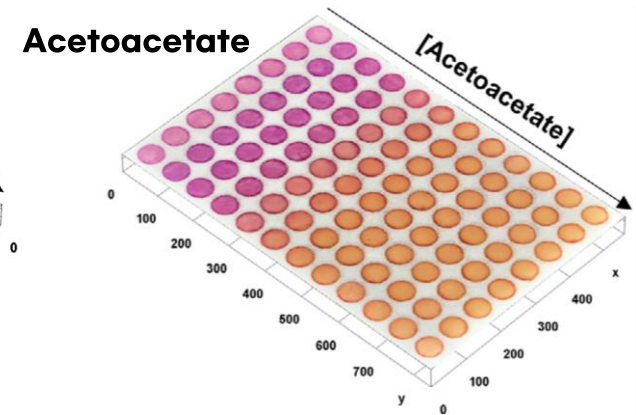
Normalized ratio
(96-PPP)



Mg^{2+}

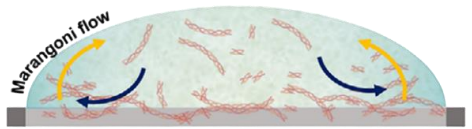


Acetoacetate

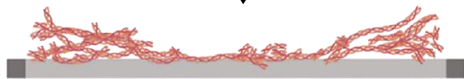


03 Key Features & Advantages

Control (without pepsin)

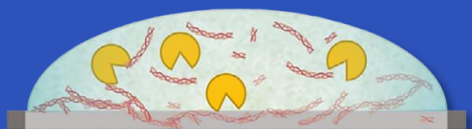


37°C, 2 hours

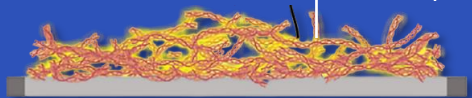


- No reaction-driven process.
- Drying- and diffusion-dominated. (coffee ring effect)

Proteolysis (with pepsin)

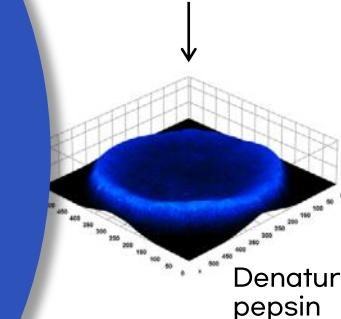
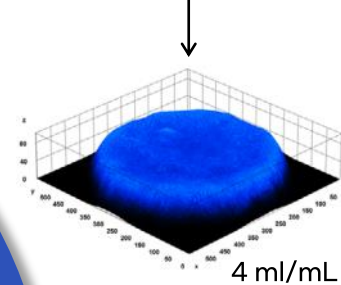
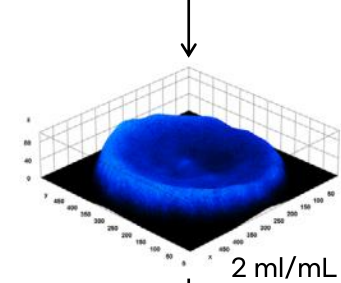
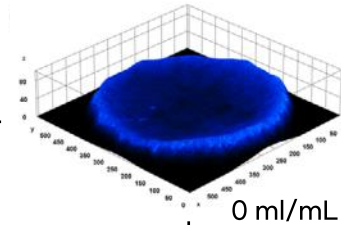


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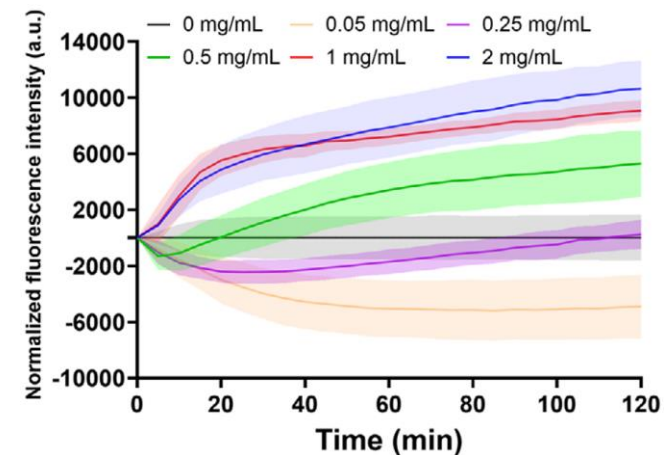
Newly synthesized amyloids

- **Reaction-driven spatial reorganization.** (amyloid proliferation)
- **Structured accumulation pattern.**



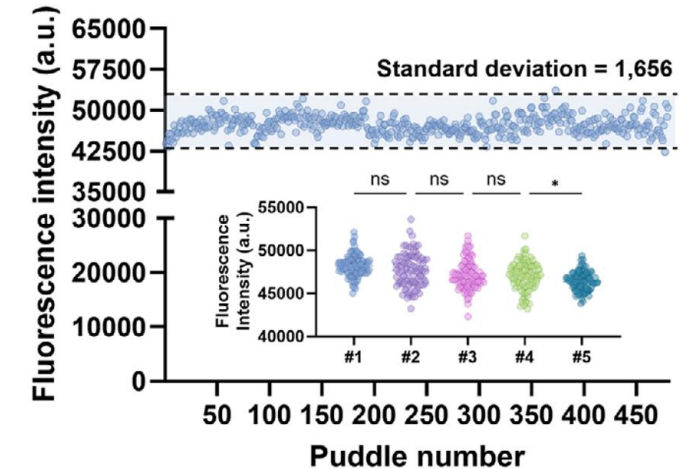
- ✓ **Structured reaction confinement** enables **time-resolved observation** of condition-dependent reaction behaviors.
- ✓ **Reproducible signal readout** across puddles ensures a **reliable** and **practically usable** analytical platform.

① Time-resolved reaction



- Time- and condition-dependent signal separation.
- Reveals reaction dynamics beyond bulk-averaged readouts.

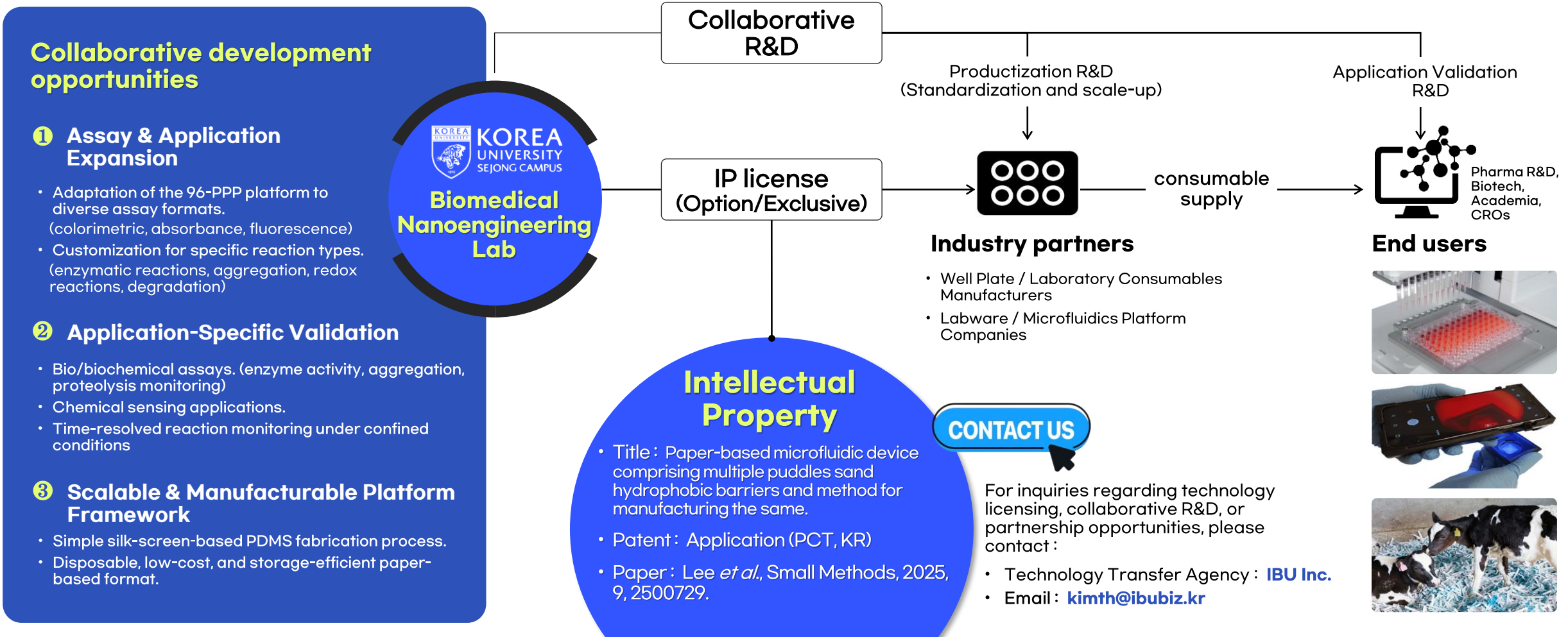
② Reproducible readout



- Reproducible signal readout across multiple puddles.
- Enables reliable high-throughput use.

04 Strategic Business Opportunities

- ✓ **Business Vision** : A paper-based next-generation plate-format platform extending reliable analysis beyond traditional laboratory settings.
- ✓ **Engagement Model** : Technology licensing and application-specific co-development partnerships.



Partnering to **unlock new business opportunities** through innovation.

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WEBSITE

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