

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



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Jan. 2026

Technology Transfer Brief

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

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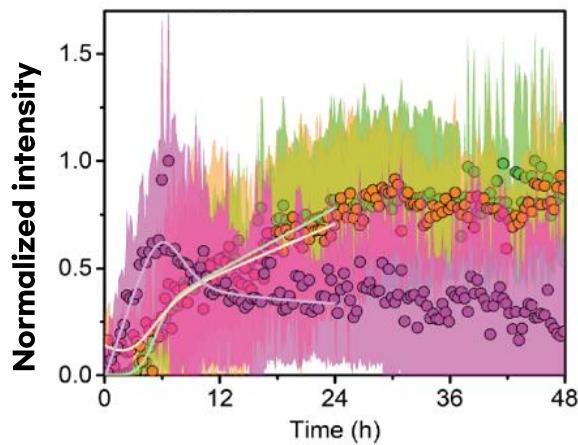


01 Reaction Behavior Is a Spatial Measurement Problem

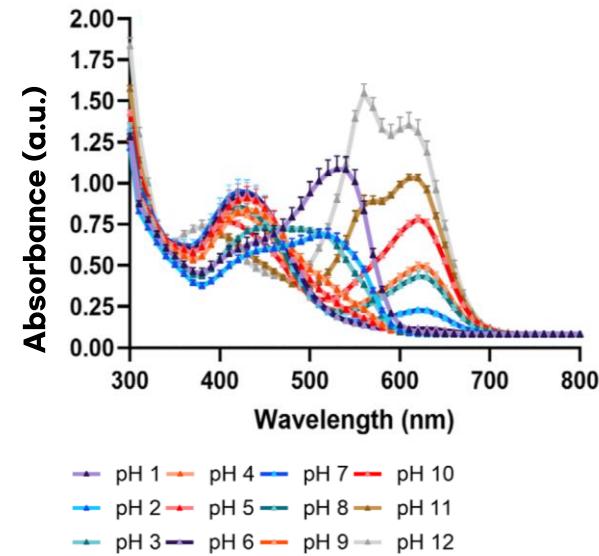
“Reaction behavior under spatially heterogeneous conditions cannot be fully captured by a single bulk-averaged readout.”

- 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.



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

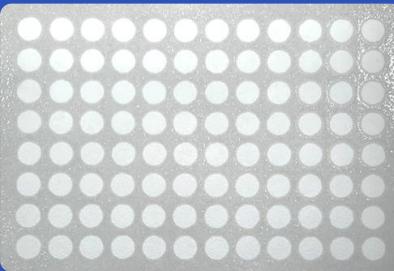


(*Source: Lee *et al.*, Small Methods, 2025)

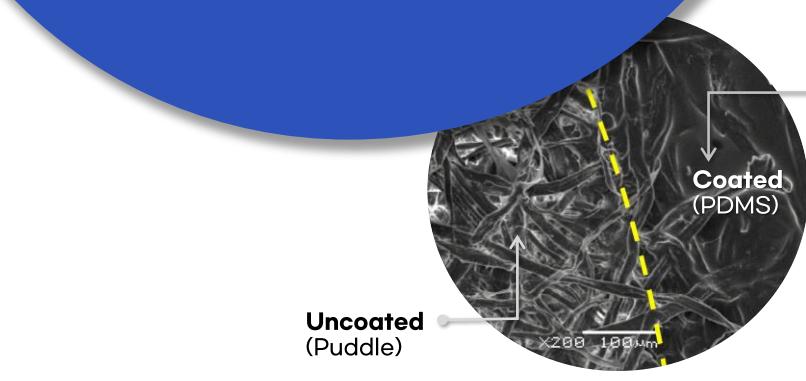


02 Technology Overview

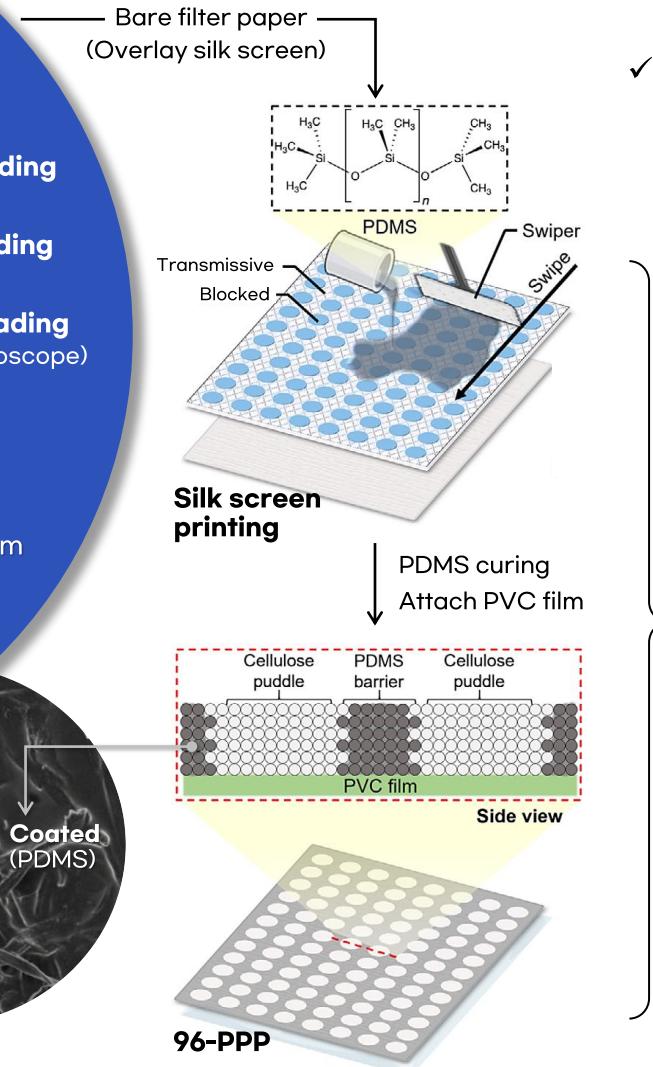
96-Puddle Paper Plate (96-PPP)



- **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.

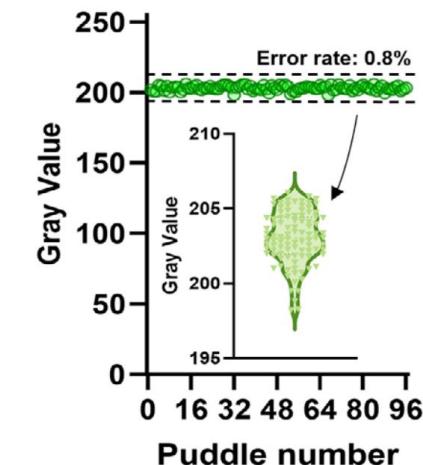


- ① **Colorimetric reading** (Smartphone)
- ② **Absorbance reading** (Microplate reader)
- ③ **Fluorescence reading** (Fluorescence microscope)



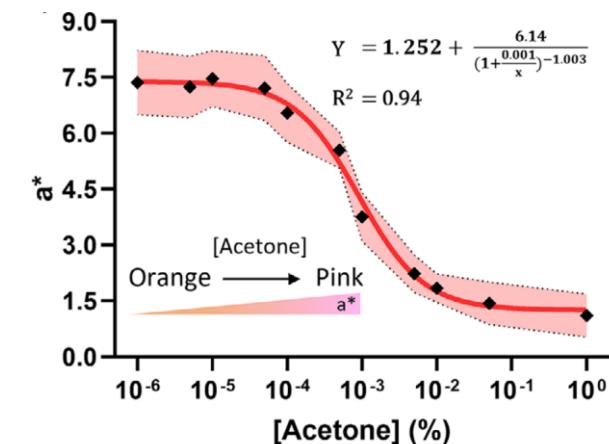
- ✓ Retaining **Spatial Reaction Significance** on a Paper-Based Analytical Platform.
- ✓ Simple fabrication, standard equipment compatibility, and validated reproducibility and quantification enable **commercial practicality**.

① Reproducibility



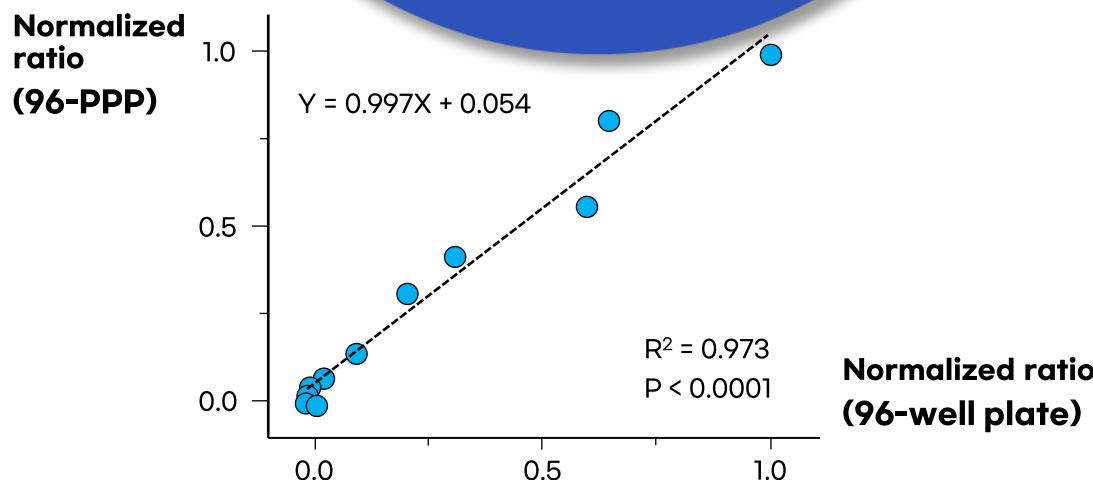
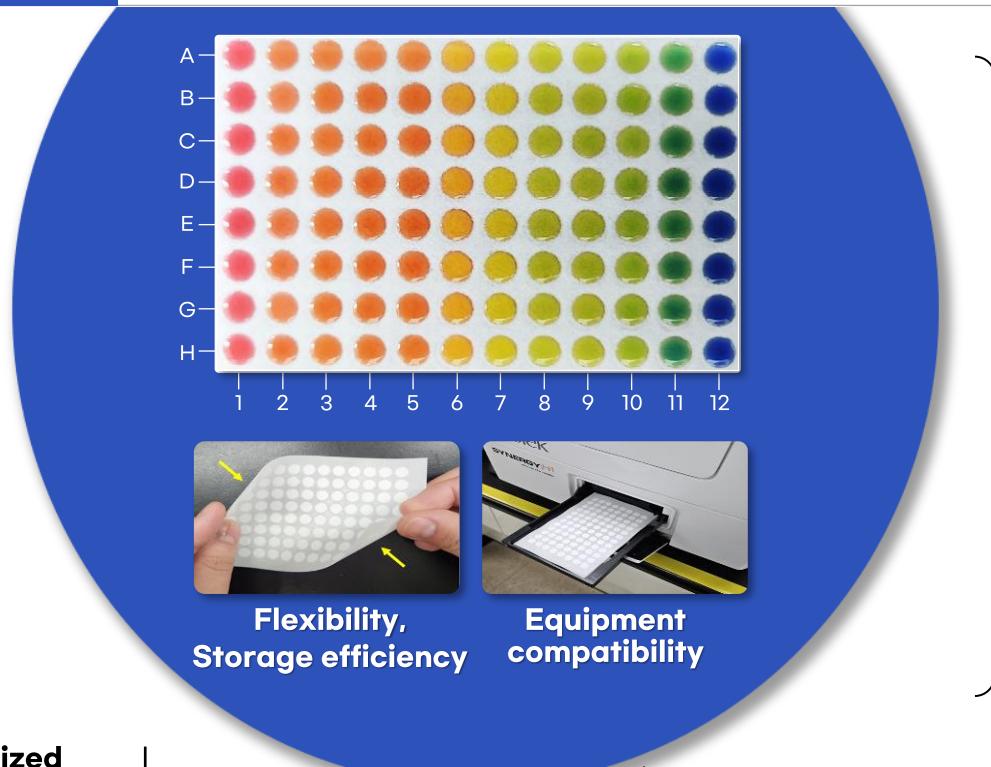
- Low variation across 96 puddles (error : 0.8%).
- High inter-puddle reproducibility.

② Quantification

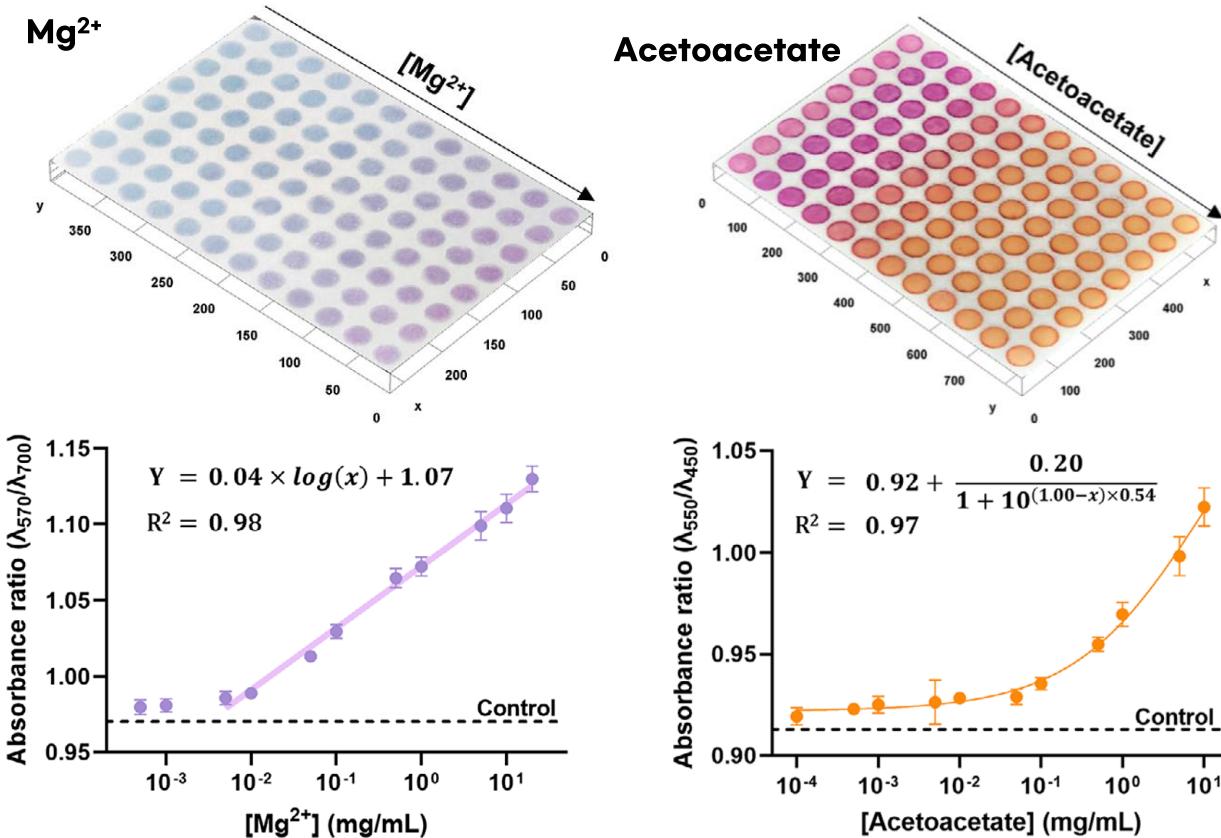


- Color parameter (a^*) correlates with acetone concentration ($R^2 = 0.94$).
- Enables quantitative colorimetric detection.

02 Technology Overview

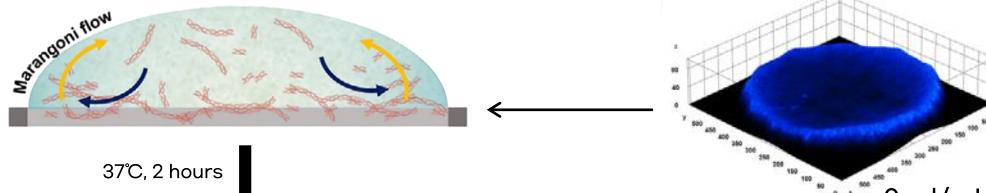


- ✓ **96-well plate compatibility** : Quantitative agreement with conventional 96-well plate assays.
- ✓ **Versatile applicability** : Applicable to chemically diverse analytes, including ions, small molecules, and metabolites.
(e.g., Mg^{2+} , ascorbic acid, acetoacetate)



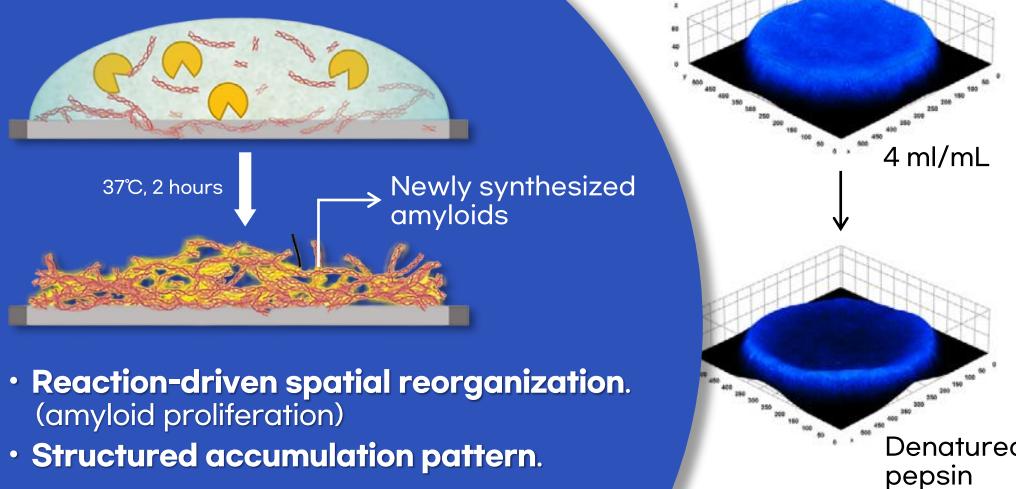
03 Key Features & Advantages

Control (without pepsin)



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

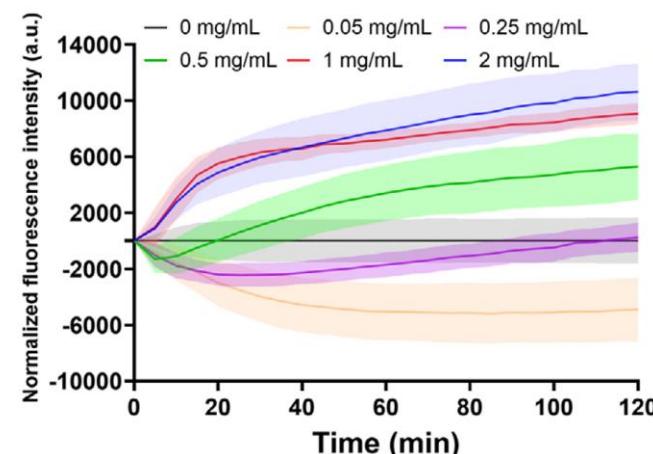
Proteolysis (with pepsin)



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

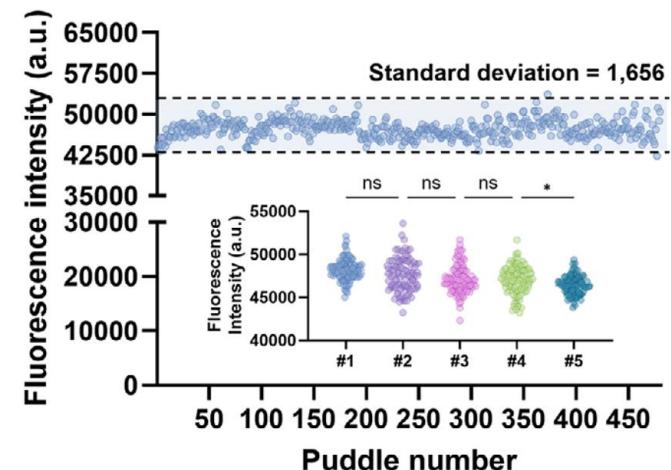
- ✓ **Structured reaction confinement** enables **time-resolved observation** of condition-dependent reaction behaviors.
- ✓ **Reproducible signal readout** across puddles ensures a **reliable and practically usable** analytical platform.

① Time-resolved reaction



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

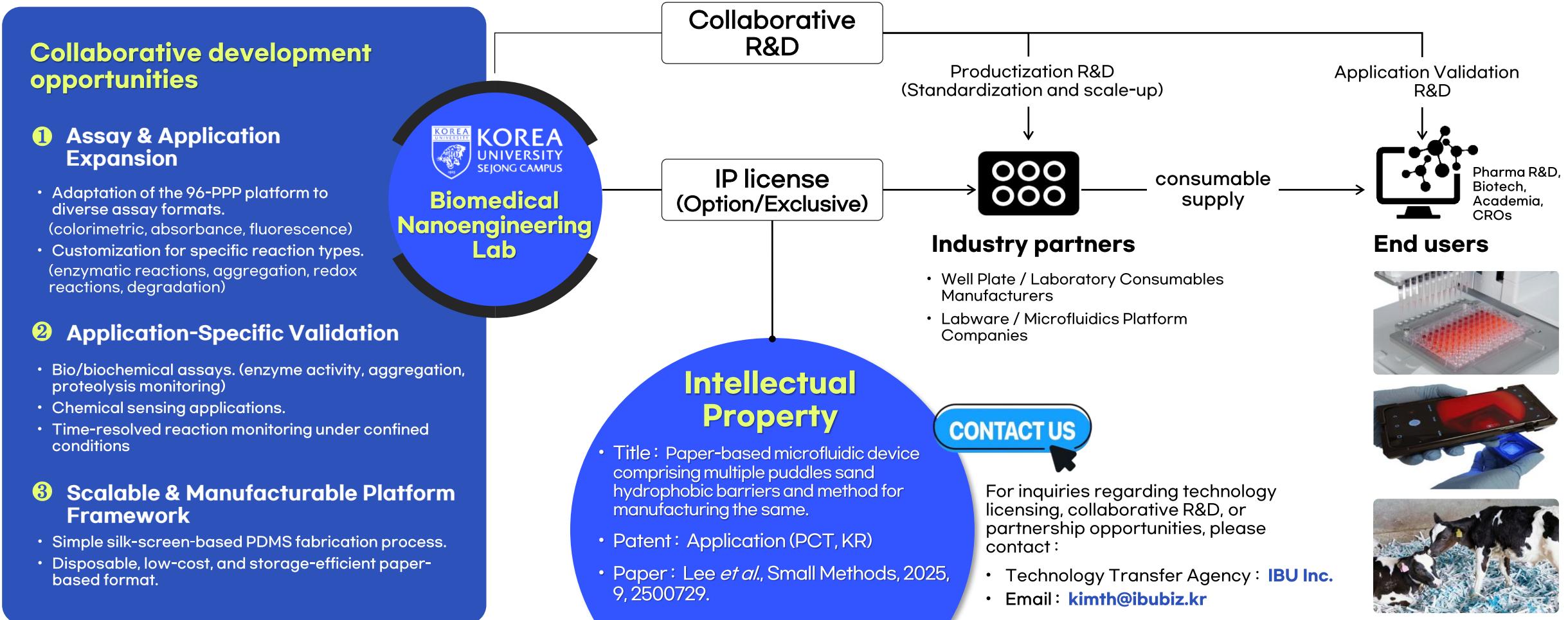
② Reproducible readout



- 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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