A VERSATILE MICROFLUIDIC PLATFORM FOR AUTOMATING COMPLEX BIOLOGICAL AND CHEMICAL PROTOCOLS

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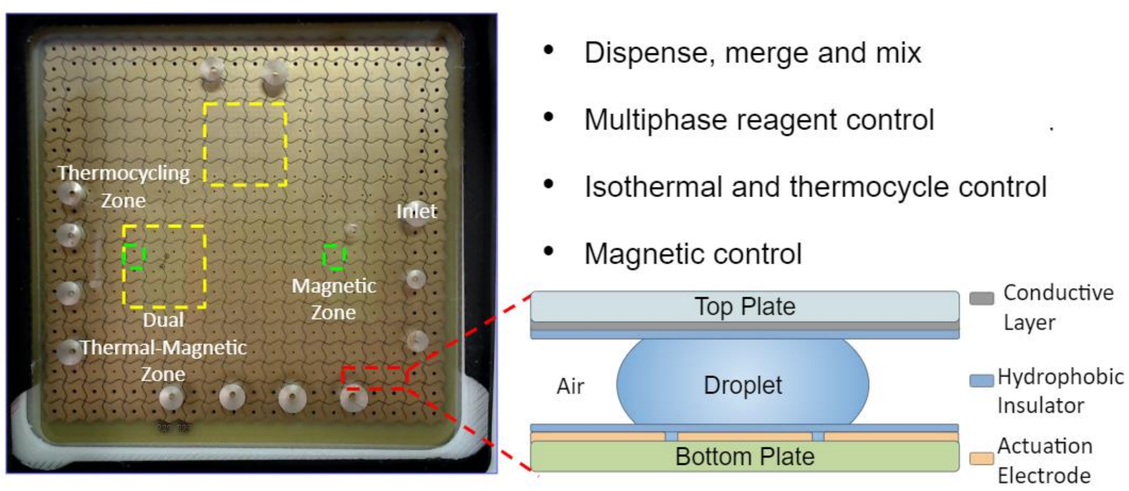
SUMMARY

Utilizing Miro Technology, Miroculus is developing a platform that allows users to easily build complex protocols for next-generation sequencing (NGS) applications and synthetic chemistry as well as run off-the-shelf cartridges for predefined workflows.

MIRO TECHNOLOGY

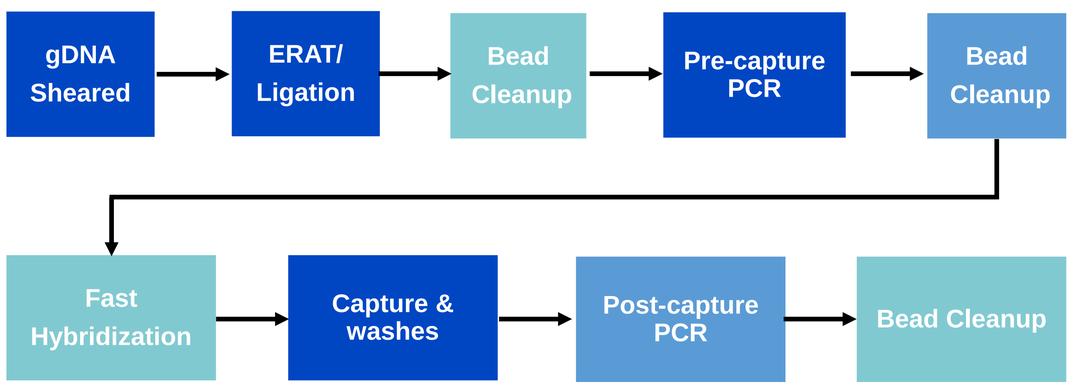
Miro Technology utilizes electromechanical forces for manipulating fluids in an automated fashion across a surface of patterned electrodes. This technology integrates key operations to perform a wide range of processes:



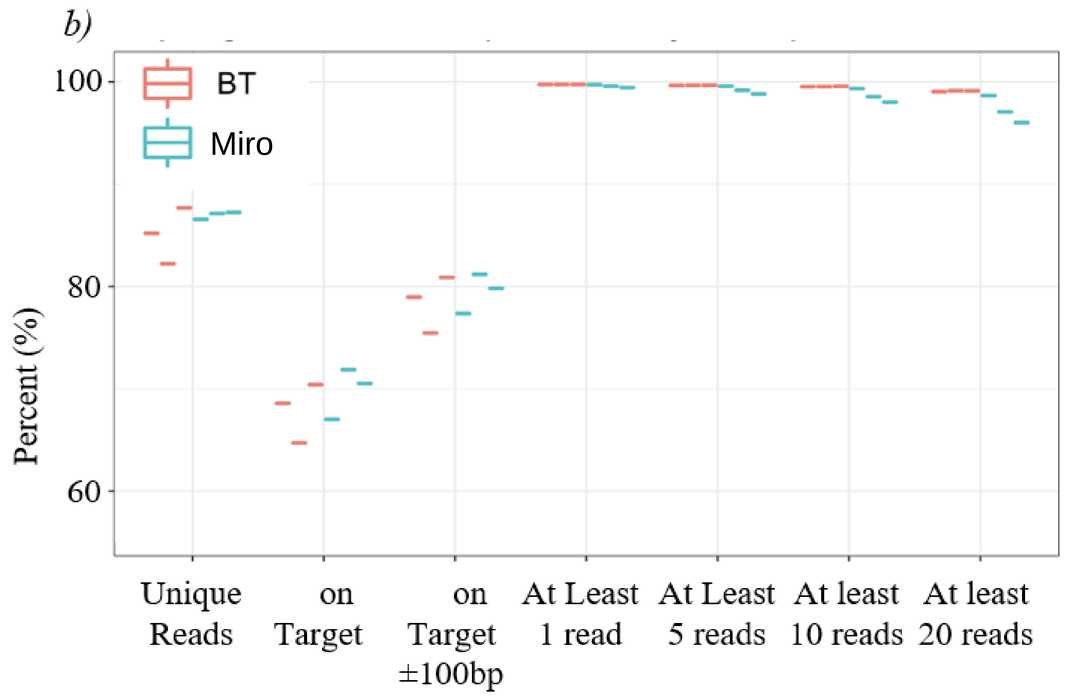
- Dispense, merge and mix
- Multiphase reagent control
- Isothermal and thermocycle control
- Magnetic control

NGS: EXOME SEQUENCING APPLICATION

- Miro Technology automates the steps required for Agilent SureSelect XT-HS target enrichment workflow.



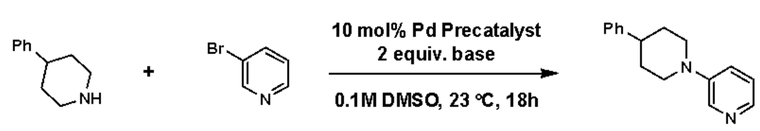
- System performance is comparable to benchtop (BT), offering advantages of automation and shorter hands-on processing times. Our initial XT-HS library preparation (Figure 2a) followed by SureSelect Focused Exome capture (Figure 2b) on Miro Technology yielded libraries within 2 - 4.5 % of BT performance across a series of sequencing metrics. With further optimization, performances equal to or higher than BT are expected.



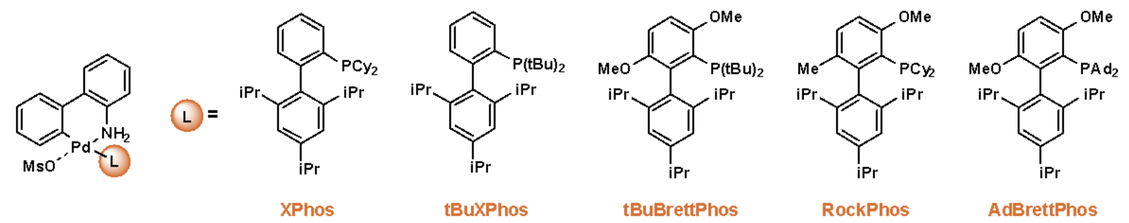
HIGH-THROUGHPUT CHEMICAL SYNTHESIS APPLICATION

- In order to expand the utility of this technology to complex chemical synthesis we designed a feasibility study around palladium-catalyzed carbon-nitrogen bond formation.

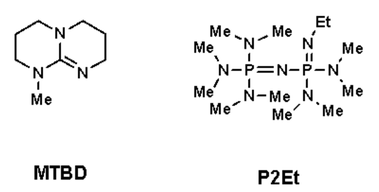
Palladium-Catalyzed C-N Reaction:



Pd Precatalysts:



Bases:

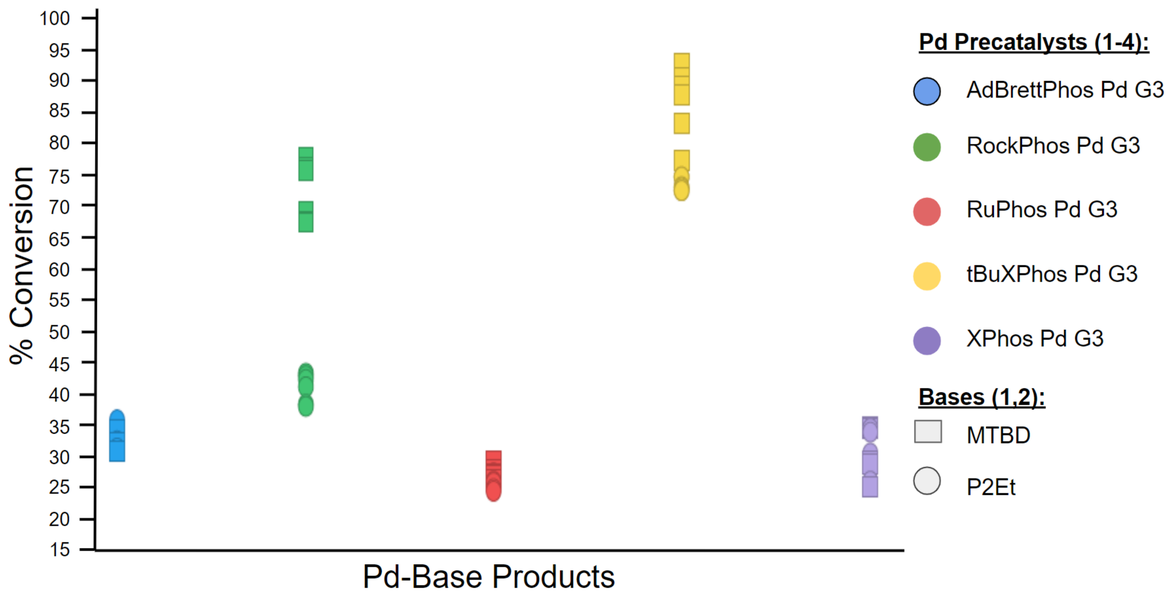


Initial nanoscale work: Santanilla *et. al. Science* **2015**, 49.

Feasibility Requirements:

- 4 component mixing
- 8 µL reaction droplets
- Dispense from stock droplet
- Operate under inert atmosphere
- Quench reactions on chip
- Observe spread in reactivity

- Analysis of the high throughput reactions on our system showed good correlation to previously reported reactivity trends for this catalytic transformation.



Acknowledgements

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