PCR on Needle

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Microtechnologies sector - Biomedical orientation

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Description

The PCR (polymerase chain reaction) technique allows to amplify a DNA sequence by repeating a cycle with a defined temperature profile commonly performed with a thermocycler. This process is relatively slow (2-3h). The scope of this project is to characterize and design a device allowing the realization of PCR cycles integrated to an air-driven single channel pipettor provided by Seyonic SA (based in Neuchâtel, Switzerland). The key feature would be to obtain a time reduction compared to the conventional PCR by increasing the surface by volume ratio (better heat exchange) and built-in liquid handling capabilities.

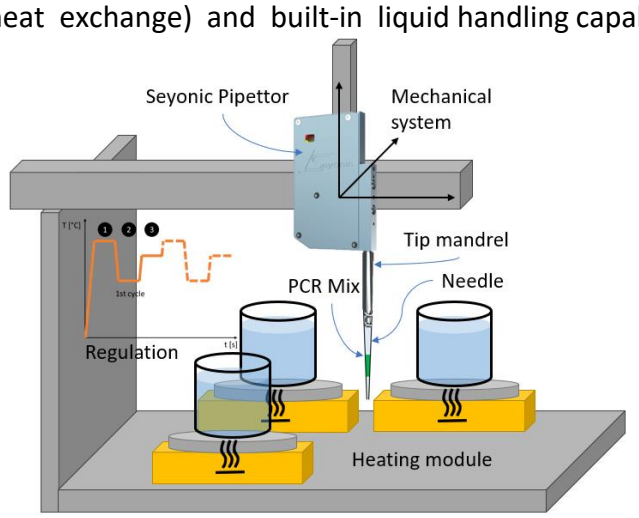

Figure 1 : PCR on Needle

Conduct

- Project introduction
  - Specification
    - Requirements' definition
    - Functional analysis
  - State of the art
- Proof of concept
  - Failure mode and effect analysis
  - Design, characterization and test
  - Conclusion: concept's validation
- Deliverable

Results and discussion

A proof of concept (Figure 1) is first carried out. The Seyonic pipettor single channel moves from one bath to the next to perform PCR into the tip. The regulation is in open loop. Time diagrams (Figure 2) are calculated with impulse response measurements.

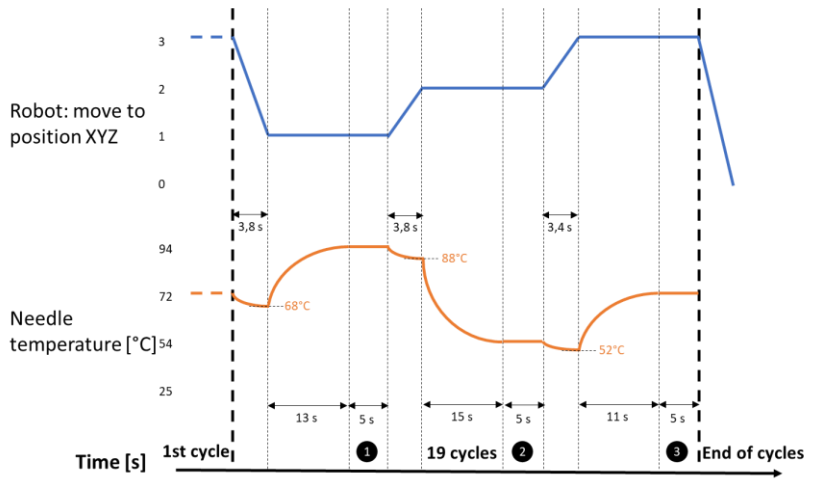

Figure 2 : Time diagrams

Results (Figure 3), the greater the staining intensity, the greater the strand amplification: Two different primers are used (PS2 and PS3)

Marker; a) and d)
MiniOne thermocycler: **20 cycles, 15 minutes**; b) and e)
Bench test tip ART50µL: **15 cycles, 16 minutes**; c)
Bench test tip ART50µL: **20 cycles, 22 minutes**; f)

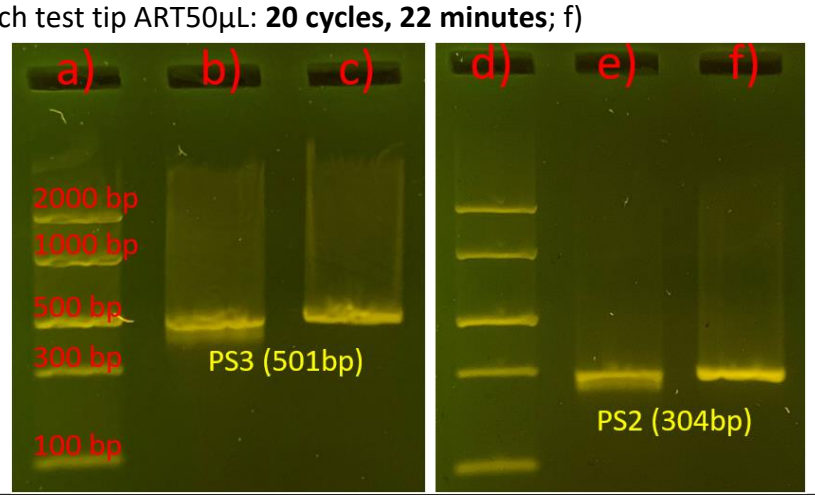

Figure 3 : Amplification results

Conclusions and prospects

In conclusion, this first concept already achieves the same amplification (measured by gel electrophoresis) as the MiniOne thermocycler, with the same cycle time. It offers good prospects in terms of amplification quality and time-saving potential for the future. This solution is easily adaptable to Seyonic 8 or 64 heads.