



PCR Purification using Digital Microfluidics

Kalyani, Neeti; Cernuda Pastor, Marc; Tanev, Georgi; Pezzarosa, Luca; Møller-Hansen, Iben; Dimaki, Maria; Borodina, Irina; Madsen, Jan; Svendsen, Winnie Edith

Publication date:
2023

Document Version
Publisher's PDF, also known as Version of record

[Link back to DTU Orbit](#)

Citation (APA):
Kalyani, N., Cernuda Pastor, M., Tanev, G., Pezzarosa, L., Møller-Hansen, I., Dimaki, M., Borodina, I., Madsen, J., & Svendsen, W. E. (2023). *PCR Purification using Digital Microfluidics*. Abstract from 2023 International Conference on Polymers for Advanced Technology, Goa, India.

General rights

Copyright and moral rights for the publications made accessible in the public portal are retained by the authors and/or other copyright owners and it is a condition of accessing publications that users recognise and abide by the legal requirements associated with these rights.

- Users may download and print one copy of any publication from the public portal for the purpose of private study or research.
- You may not further distribute the material or use it for any profit-making activity or commercial gain
- You may freely distribute the URL identifying the publication in the public portal

If you believe that this document breaches copyright please contact us providing details, and we will remove access to the work immediately and investigate your claim.

PCR Purification using Digital Microfluidics

Neeti Kalyani¹, Marc Cernuda Pastor², Georgi Tanev³, Luca Pezzarosa³, Iben Møller-Hansen², Maria Dimaki¹, Irina Borodina², Jan Madsen³, Winnie Edith Svendsen³

¹DTU Bioengineering, Technical University of Denmark, Kongens Lyngby, Denmark

²DTU Biosustain, Technical University of Denmark, Kongens Lyngby, Denmark

³DTU Compute, Technical University of Denmark, Kongens Lyngby, Denmark

Email: neeka@dtu.dk

Digital microfluidics (DM) is an advanced technology in microfluidics where electrowetting force is used to control and manipulate nanolitre and microliter-sized droplets on a set of electrodes.¹ DM has gained considerable attention because of fast heat transfer, less reagent volume due to miniaturization of reaction, small footprints and incredible control of droplets. This technique minimizes the analysis time and efforts and offers innovative prospects for process automation and integration in a unique setup. It is very favorable for high throughput applications. The movement of droplets using DM requires a hydrophobic surface on which the processes can be performed easily. SLIPS (Slippery liquid infused porous surface) have been demonstrated to be used as a surface for digital microfluidics because of antifouling properties and fine movement of droplets.² SLIPS is fabricated by utilizing porous polymeric substrate infused with the slippery fluid.

PCR product purification is important step in molecular cloning. The purification is done to remove the enzymes, primers, salts and other non-reacted components from the reaction to get pure amplified band.³ The purity of PCR product is crucial for the gene sequencing, aptamer sequencing and cloning. In addition to this, whole genome sequencing techniques have increased the need for the purity of the nucleic acids used. Purification of DNA using commercially available kits is cumbersome, time-consuming and generates a lot of plastic waste. With digital microfluidics, the high throughput purification of nucleic acids can be achieved. The DM platform used in this study is developed in-house.⁴ Magnetic nanoparticles have been employed for the purification of PCR product on the DM platform as they have tendency to bind to the DNA. The binding of the DNA to the nanoparticles can be tuned by altering the ratio of DNA and nanoparticles. A pure DNA band, free of primers is obtained on agarose gel after purification via DM.

References:

1. Q. Ruan, W. Ruan, X. Lin, Y. Wang, F. Zou, L. Zhou, Z. Zhu, C. Yang, *Sci. Adv.*, 2020, 6, eabd6454
2. H. Geng, S. K. Cho, *Lab on a Chip*, 2019, 19, 2275-2283
3. Y. Zhou, Y. Zhang, W. He, J. Wang, F. Peng, L. Huang, S. Zhao, W. Deng, *Sci. Rep.*, 2018, 8, 12870
4. G. Tanev, W. E. Svendsen, J. Madsen, *Micromachines*, 2022, 13(2), 249