engineering proceedings

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Abstract

Separation Microfluidic Device Fabricated by Micromilling Techniques †

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† Presented at the 1st International Conference on Micromachines and Applications, 15–30 April 2021; Available online: https://micromachines2021.sciforum.net/.

Abstract: The diagnosis of several diseases can be performed by analyzing the blood plasma of a patient. Despite extensive research work, there is still a need to improve current low-cost fabrication techniques and devices for the separation of plasma from blood cells. Microfluidic biomedical devices have great potential for that process. Hence, a microfluidic device made by micromilling and sealed with an oxygen plasma technique was tested by means of two different blood analogue fluids. The device has four microchannels with similar geometries but different channel depths. A high-speed video microscopy system was used for the visualization and acquisition of the flow of the analogue fluids throughout the microchannels of the device. Then, the separation of particles and plasma was evaluated with the ImageJ software by measuring and comparing the grey values at the entrance and the exit of the channel. The device showed a significant reduction of the amount of cells between the entrance and the exit of the microchannels. The depth of the channels and the size of the particles were not found to exert any major influence on the separation process. However, it was found that the flow rate affected the separation results, as the best results were obtained for a flow rate of 100 μL/min. Though these results are promising, further analyses and optimizations of microfluidic devices, as well as comparisons between devices sealed using different methods such as the solvent bonding technique, will be conducted in future works.

Keywords: micromilling; microfluidic devices; particle separation; blood analogues; image analysis

Citation: Gonçalves, I.M.; Madureira, M.; Miranda, I.; Schütte, H.; Moita, A.; Minas, G.; Gassmann, S.; Lima, R. Separation Microfluidic Device Fabricated by Micromilling Techniques. *Eng. Proc.* **2021**, *4*, 37. https://doi.org/10.3390/Micromachines2021-09599

Academic Editor: Ion Stiharu

Published: 16 April 2021

Supplementary Materials: The supplementary file is available online at https://www.mdpi.com/article/10.3390/Micromachines2021-09599/s1.

Institutional Review Board Statement: Not applicable.

Informed Consent Statement: Not applicable.

Data Availability Statement: The data presented in this study are openly available at https://doi.org/10.3390/ma14092451; https://doi.org/10.3390/mi10090593; https://doi.org/10.1039/D1SM00106J; https://doi.org/10.1007/s00348-020-03066-7; https://doi.org/10.1109/ICIT.2015.7125594; https://doi.org/10.1063/1.4998190; https://doi.org/10.3390/mi7010004.