

Numerical Modeling Of High Aspect Ratio μ Pillars At Different Viscosities And Flow Rates

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Abstract

The advent of Micro/Nano fluidic technologies has enabled researchers from various fields to use these advancements for analysis and experiments. In this work we present such a device that can be used for analyzing coagulation of blood in a microchannel by measuring the displacement of μ Pillars. The measure of displacement/bending of these micro structures is used as a tool to see the effects of fluids of different viscosities on pillar movement. The simulation results are compared with experimental results and a reasonable agreement was found between simulation and experimental results.

CFD module of COMSOL Multiphysics® software was used to model our device. In order to incorporate the effects of fluid flowing in a microchannel we used laminar flow sub module which solves continuity and momentum equation and for measuring displacement of μ Pillars solid mechanics module was used which solves for out of plane strain displacement and also for displacement field u . Multiphysics module was used to couple the above mentioned Physics modules.

Figure 1 shows displacement of an array of μ Pillars under different flow conditions at different viscosities. Figure 2 and 3 present graphical results for simulations and experiments performed. Figure 04 presents the experimental setup used. We observed a reasonable agreement between the experimental and simulation results.

Reference

1. Sniadecki, Nathan J; Chen, Christopher S; ,Microfabricated silicone elastomeric post arrays for measuring traction forces of adherent cells, *Methods in cell biology*,83,,313-328,2007,Elsevier
2. Liang, Xin M; Han, Sangyoon J; Reems, Jo-Anna; Gao, Dayong; Sniadecki, Nathan J; ,Platelet retraction force measurements using flexible post force sensors, *Lab on a Chip*,10,8,991-998,2010,Royal Society of Chemistry

Figures used in the abstract

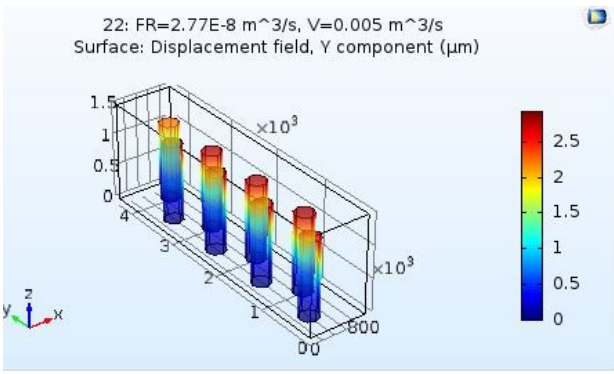


Figure 1

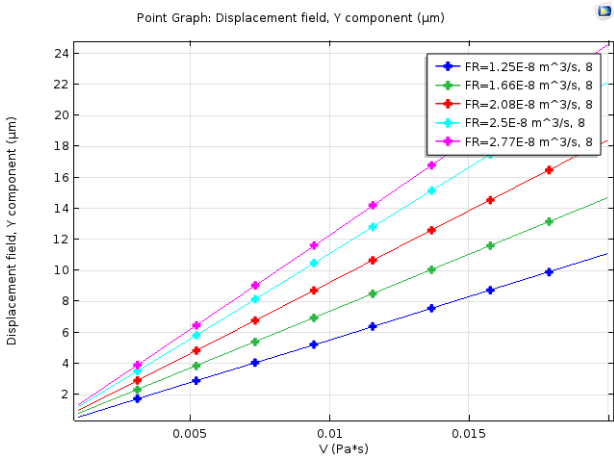


Figure 2



Figure 3

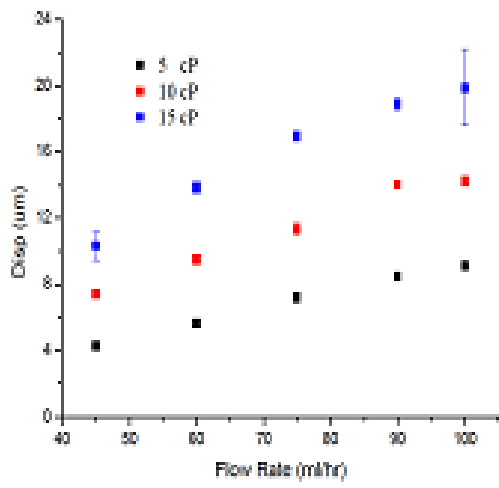


Figure 4