Fe-PDMS fabricated microchannels for peristaltic pump applications

Leu T.-S., Jiang P.-C.

Institute of Nanotechnology and Microsystem Engineering, National Cheng Kung University, Tainan, Taiwan; Department of Aeronautics and Astronautics, National Cheng Kung University, Tainan, Taiwan

Abstract: Fe-PDMS is a material that mixes iron powders in polydimethylsiloxane (PDMS) to form a magnetically actuated microstructure. In this paper we describe fabrication of Fe-PDMS microstructures. Fe-PDMS material with different weight ratios ranging from 50% to 83.3% is tested for its processing capability, as well as actuation performance. To demonstrate material's usefulness we have designed, fabricated, and tested a micro peristaltic pump that utilize an Fe-PDMS microchannel structures. The Fe-PDMS microchannel for peristaltic pump design is the better choice for disposal biochip applications because of its simplicity and cost-effective in fabrication. In this micro peristaltic pumps study, Fe-PDMS with 75% by weight is found to be the optimal parameter based on the maximum flow rate within processing capability constraints. The flow rate achieved is 92 μl/min for the current micro peristaltic pump design with the channel width (Wc) 1500 μm, channel height (Dc) 150μm and channel membrane thickness (Tm) 80μm. Driving frequency at 2.0 Hz is suggested for the optimal operation condition.

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Authors with affiliations:

1. Leu, T.-S., Institute of Nanotechnology and Microsystem Engineering, National Cheng Kung University, Tainan, Taiwan, Department of Aeronautics and Astronautics, National Cheng Kung University, Tainan, Taiwan
2. Jiang, P.-C., Institute of Nanotechnology and Microsystem Engineering, National Cheng Kung University, Tainan, Taiwan