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Surface tension analysis of cost-effective paraffin wax and water flow simulation for microfluidic device

Abstract

In microfluidic devices, the most important aspect has to be considered for the manufacturing process is the material suitability and geometric design. Among the materials studied, paraffin wax has never been tested and it is proposed as the new approach in this paper for patterning the microchannels. Furthermore, contact angle analysis of the paraffin wax was also studied. Based on the contact angle measurements; the hydrophobicity and surface tension of paraffin wax were analyzed. From the finding, it shows that paraffin wax has a low surface tension and high hydrophobicity. Then, several microchannels design was simulated using COMSOL multiphysics 4.2 software in order to find the optimized geometry. It involves a study of different shape, diameter, length, and angle of microchannels design, and its influence on the water flow velocity. From the simulation results, an optimize microchannels design was obtained consists of 1000 µm channels diameter, 1000 µm inlet channel length, 1.0 cm outlet channels length, and 110o inlet channel angle with water flow velocity of 2.3cm/s. Further study could be done to improve the finding of properties and geometric suitability for microfluidic device.

Keywords; Contact Angle, Microfluidic, Paraffin Wax, Surface Tension, Water Flow Velocity