Size-based particles processing using microfluidic fabric-based analytical device

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Size based particles or cells separation is vital in the field of diagnostics and health care. There is a rapid shift towards the miniaturization of complex macro processes. Channel design and fabrication of a set of microfluidic devices using simple wax patterning method on cotton fabric to sort and separate size based particles for point of care diagnostics is described. We demonstrated that the wicking property of cotton microfluidic channel can be improved by scouring in soda ash (Na_2CO_3) solution which will remove the natural surface wax and expose the underlying texture of the cellulose fiber. Then, narrow hydrophilic channels with hydrophobic barriers were fabricated in cotton fabrics by patterning wax to define the 2D microfluidic devices to be further made into 3D devices by folding. The channel porosity can be further reduced by impregnating the cotton fabric channel partially with wax. Hence, the fabric-based channel separate particles/cells through their different wicking rate into the different channels having different porosity, depending on the particles' size. Polystyrene microsphere beads with 4µm and 10 µm size were used to perform proof-of-concept experiment for particle separation by size in this study. Data collection was conducted using Scanning Electron Microscope (SEM) and fluorescence microscope. Results have shown that 3D devices using interlayer wicking can separate the particles optimally. Smaller beads of 4 µm could go to the outlet, while the larger beads of 10 µm have been stopped at various places of the channel. In conclusion, we have achieved size-based particles/cells sorting by varying the porosity of the microfluidic device channel through

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