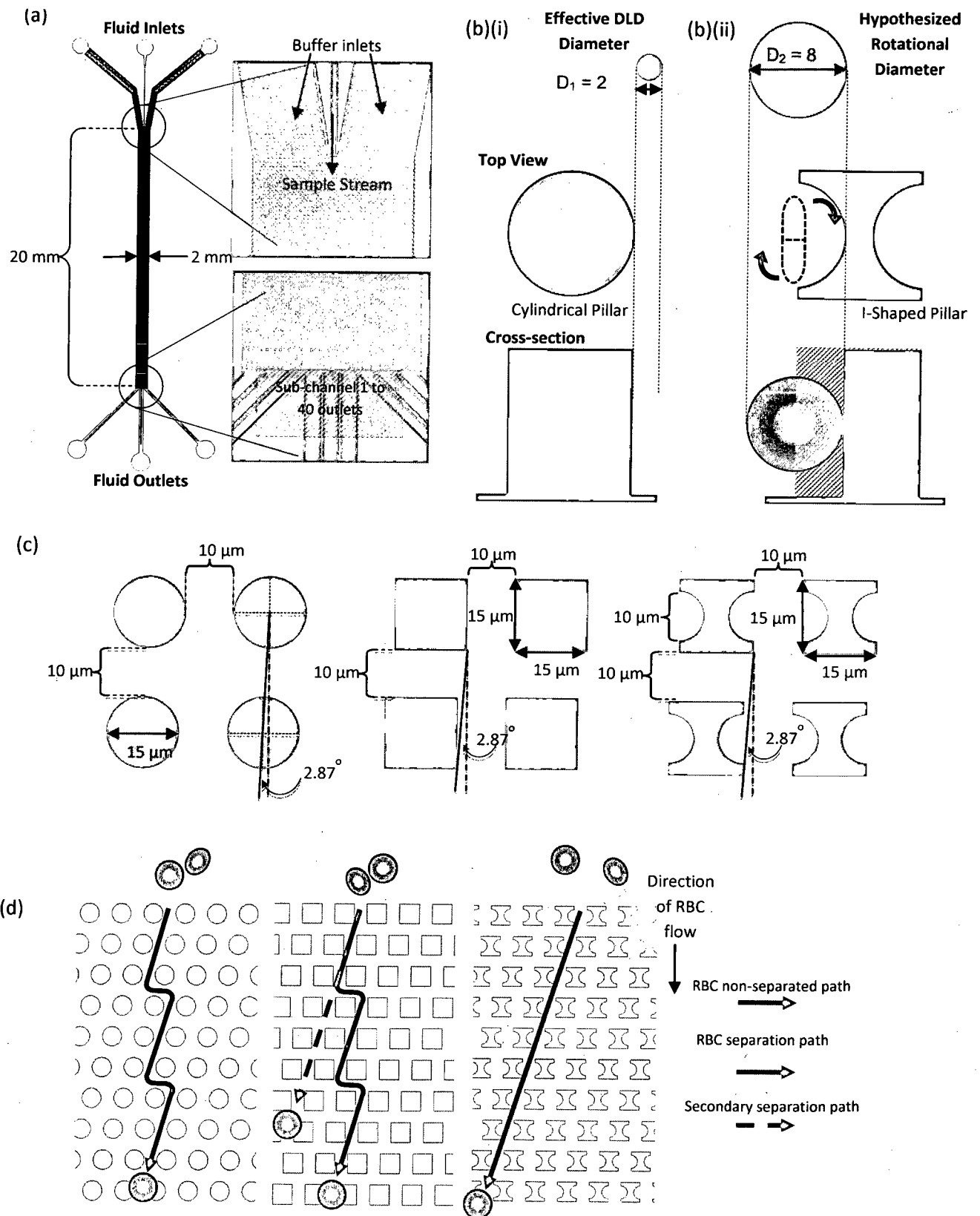


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Figure 1



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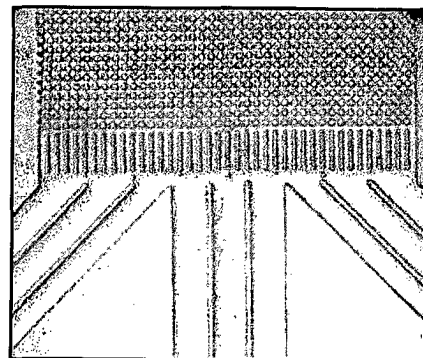
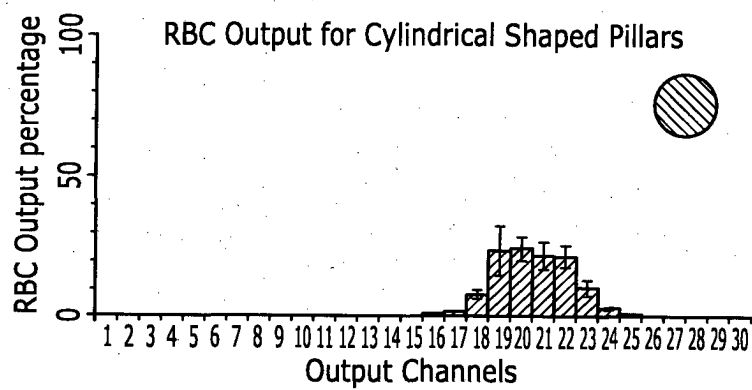


Figure 2(a)

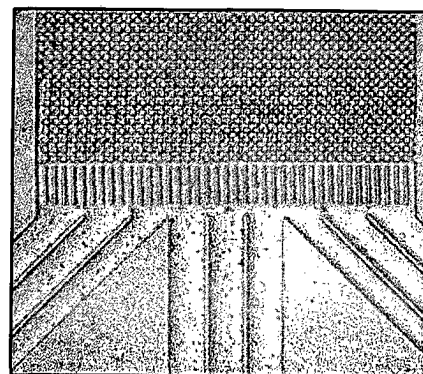
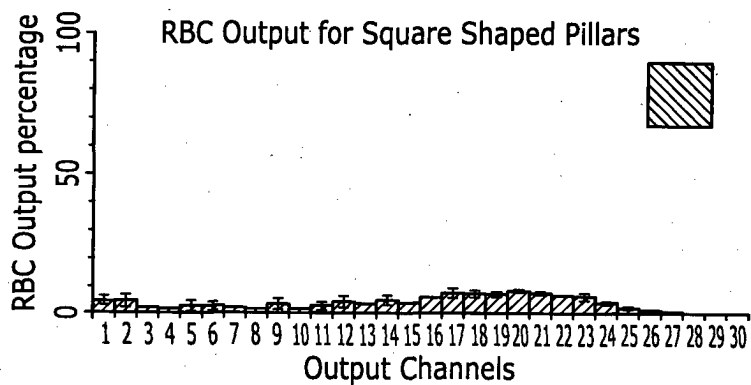


Figure 2(b)

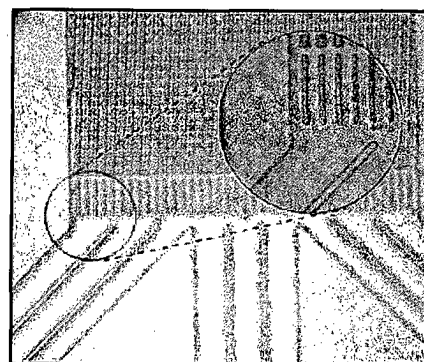
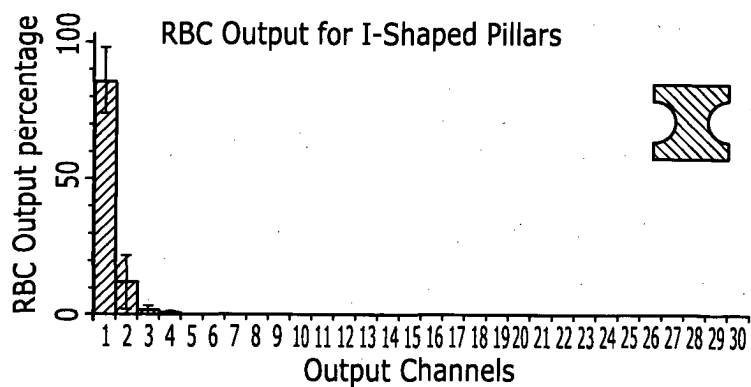
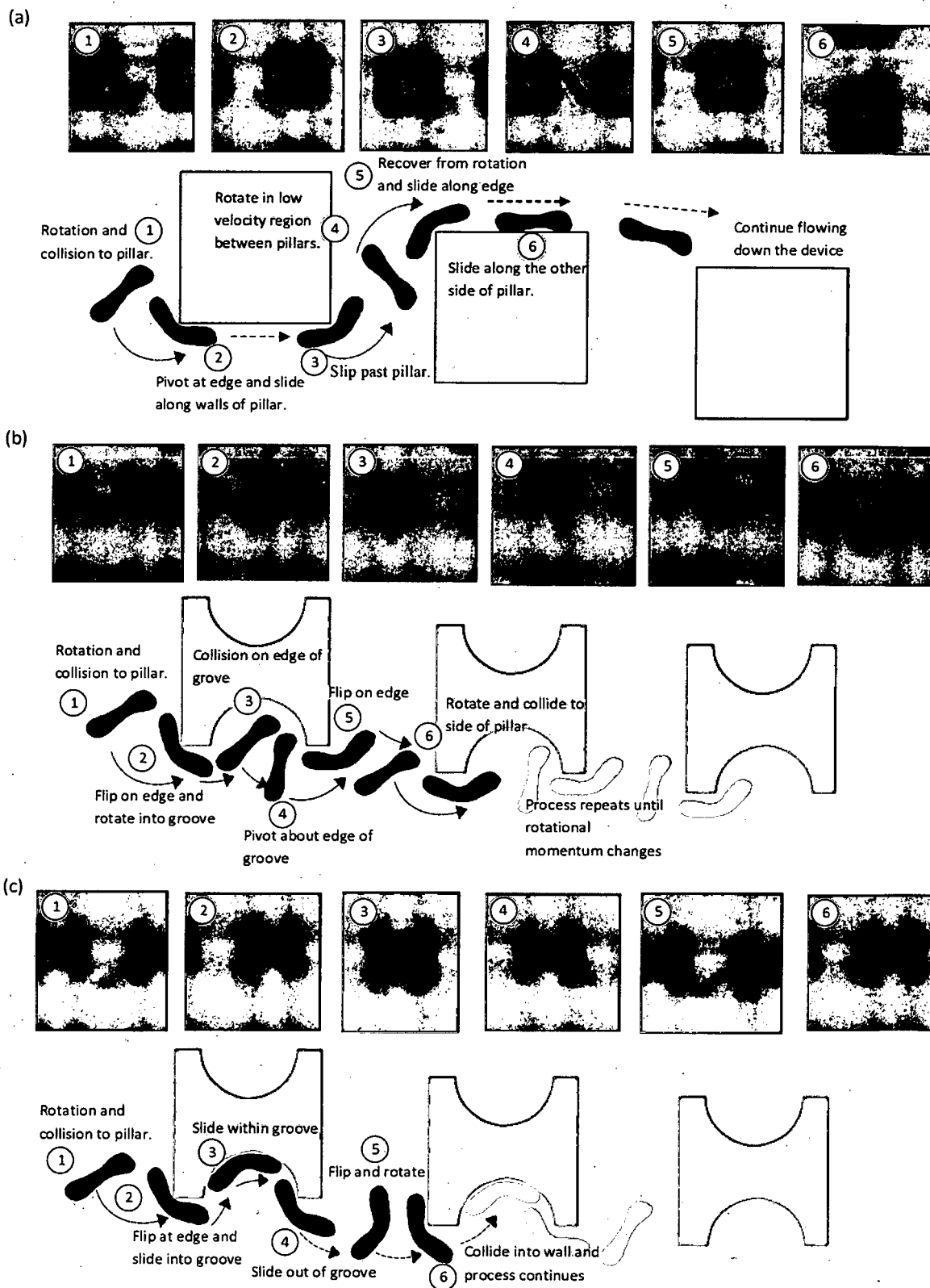


Figure 2(c)

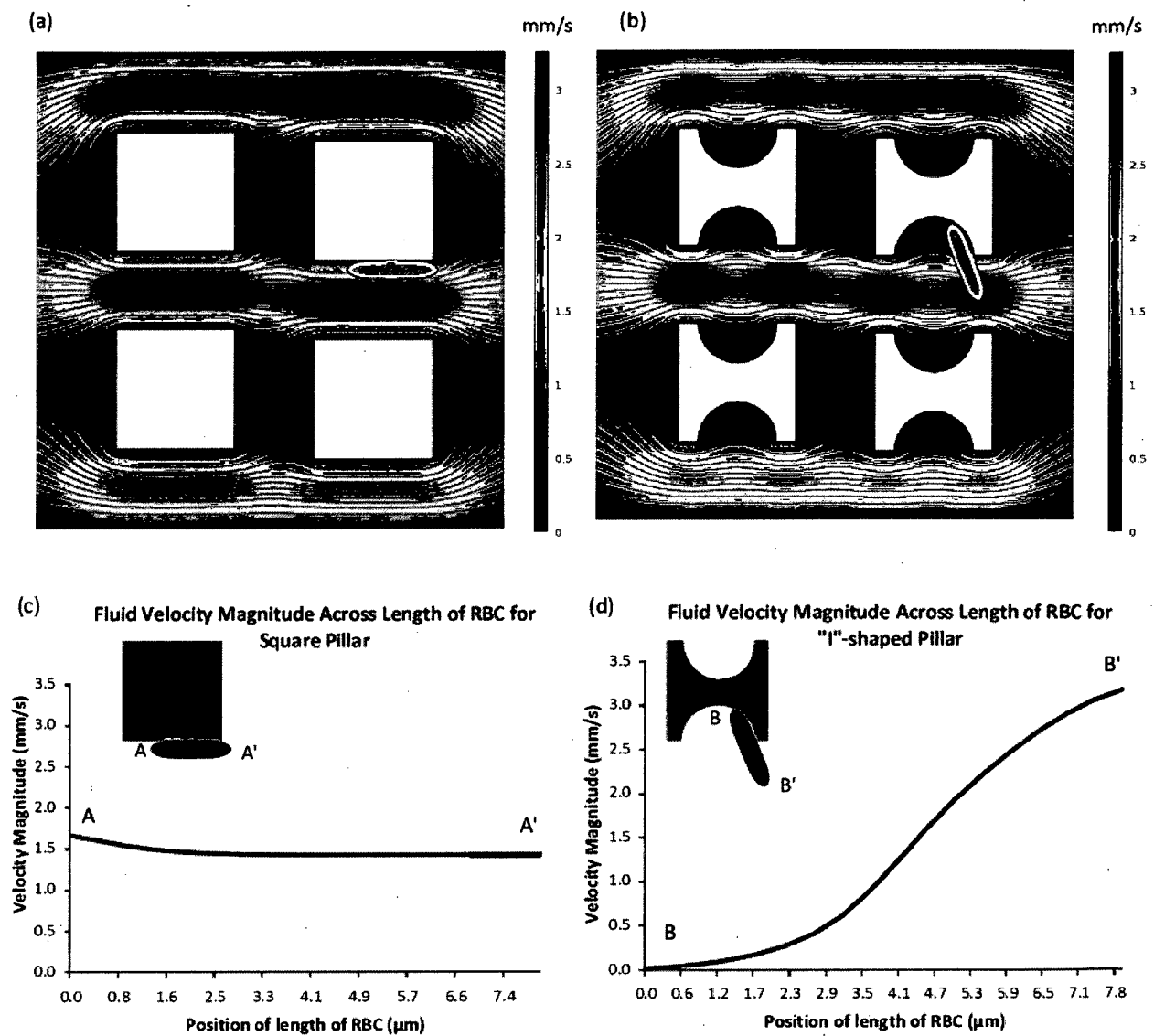
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Figure-3



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Figure 4



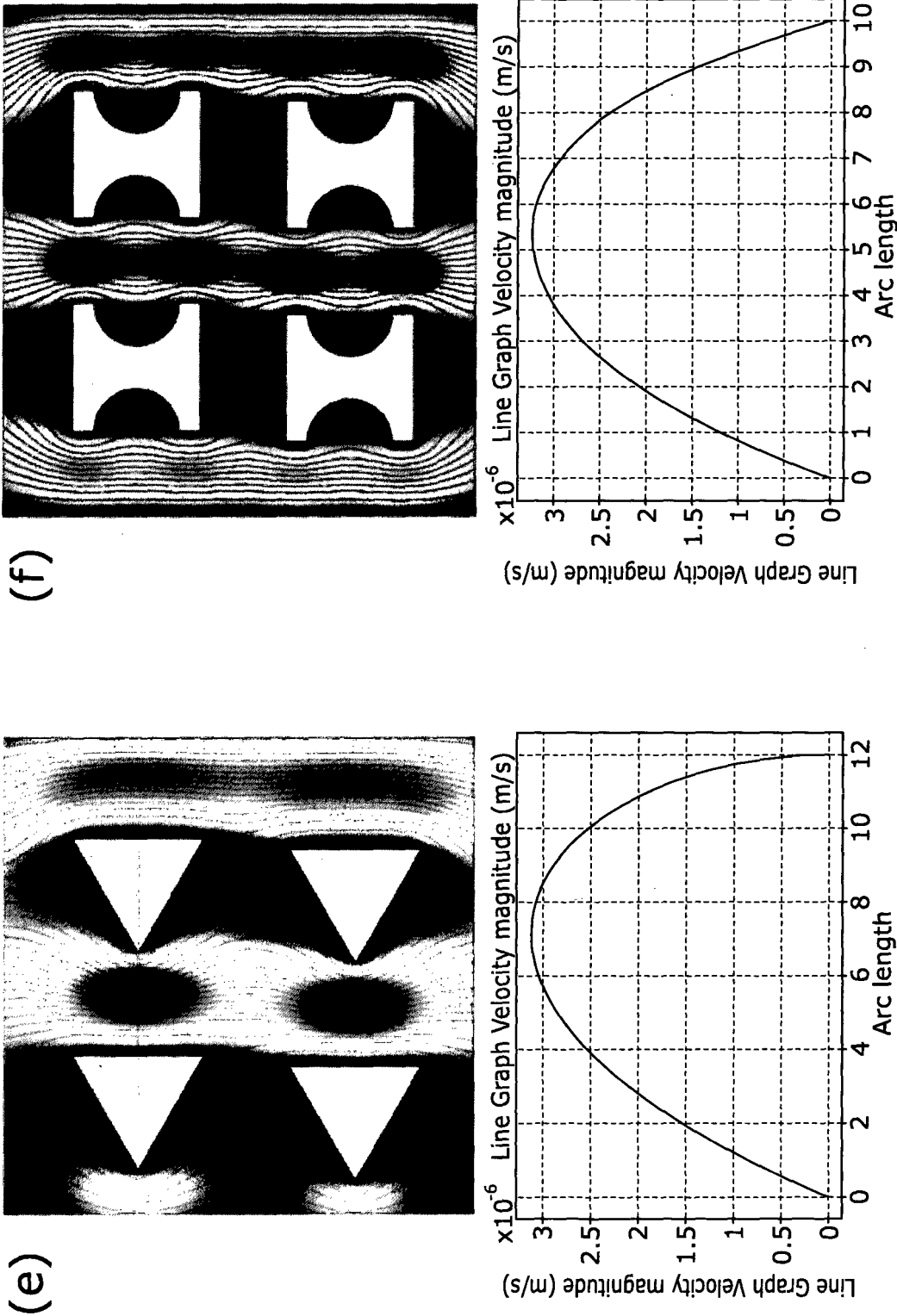


Figure 4. Schematics of Triangle pillars and I-shape pillars cross-sectional flow profile. (e) depicts the cross-sectional asymmetrical fluid flow profile depicted in the A-A' cross section. The same orientation of cross-section is shown in I-shape pillar device for symmetrical flow in (f).

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Figure 5



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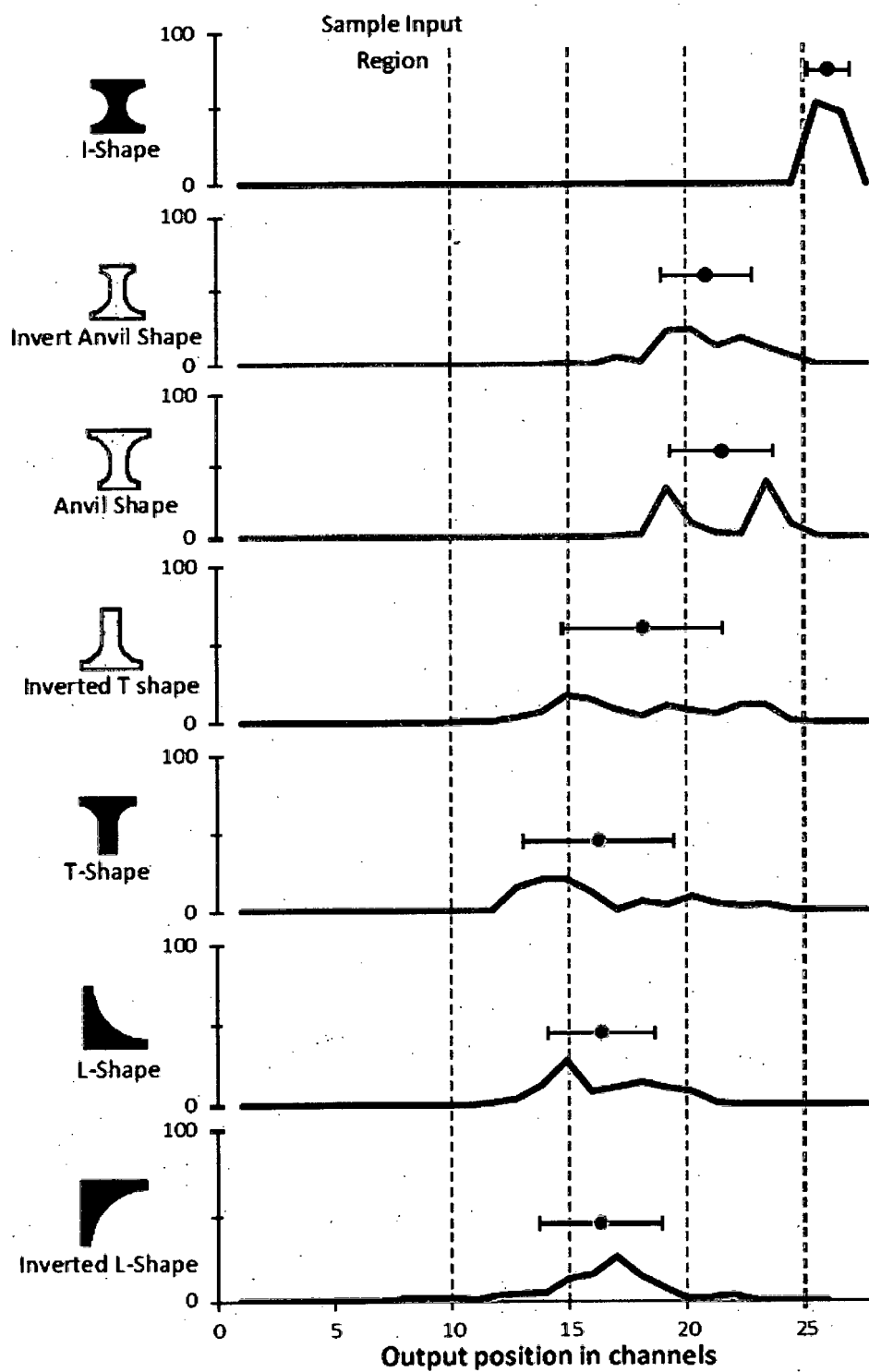


Figure 6. Graph of 3.0 micron bead separation in various pillar shapes.

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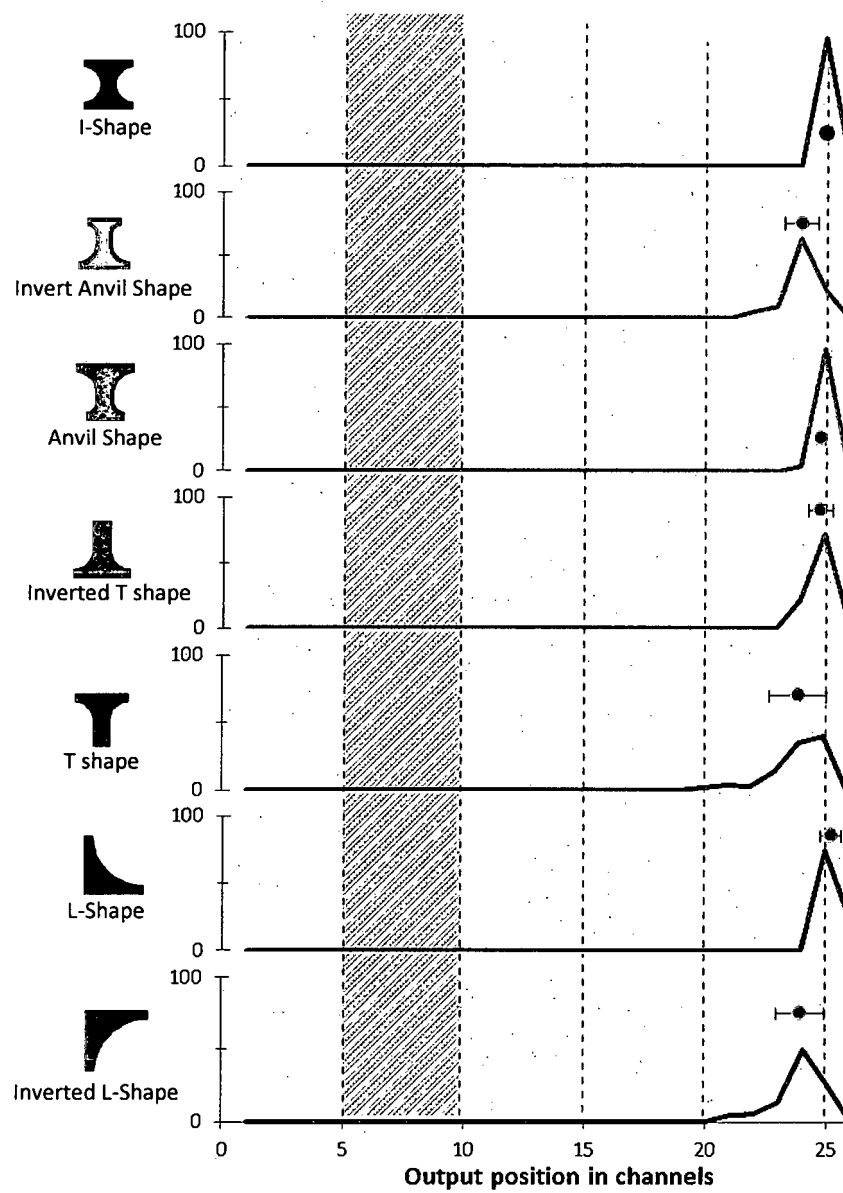


Figure 7. Graph of 3.5 micron bead separation in various pillar shapes.

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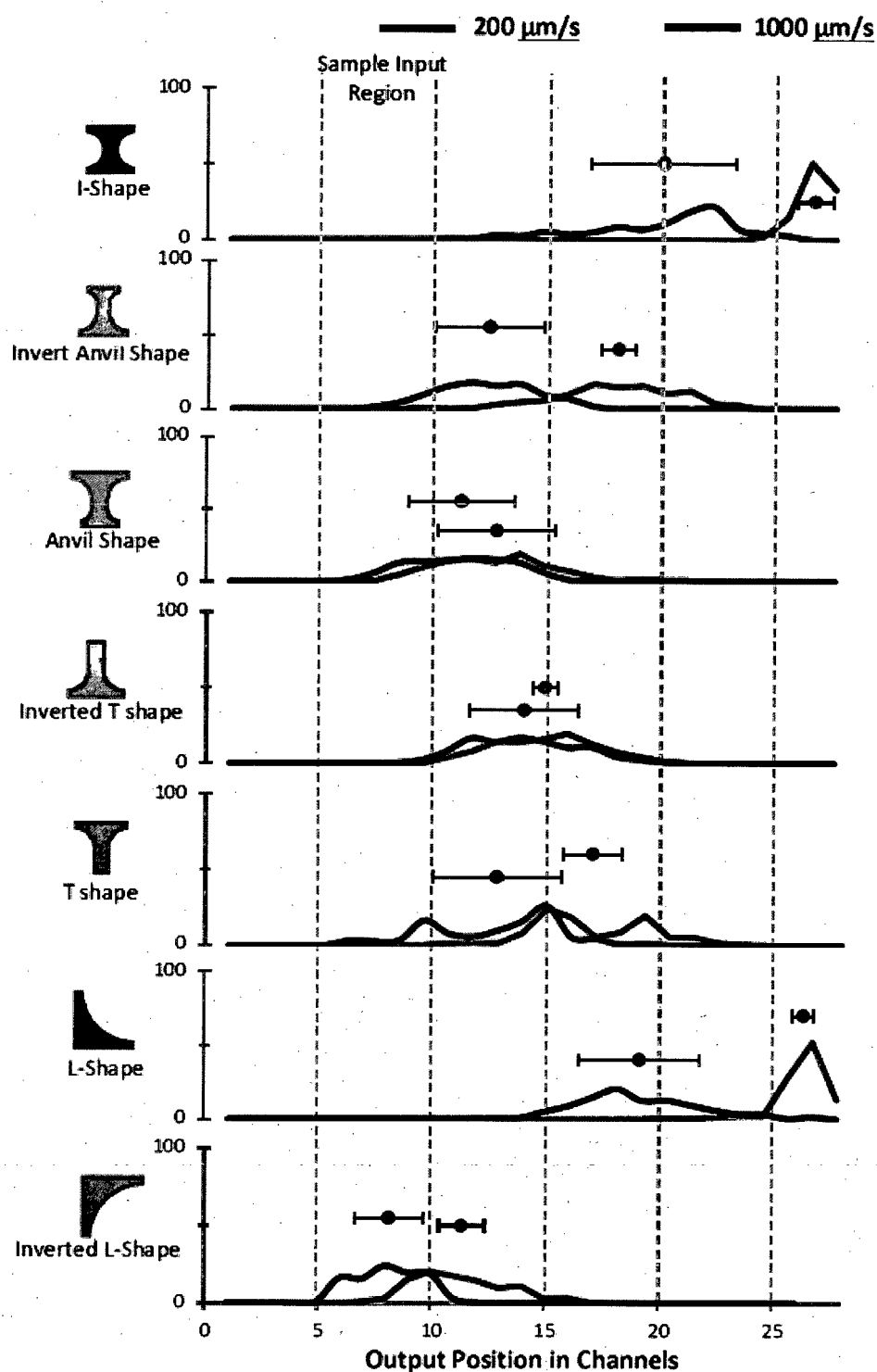


Figure 8. Graph of RBC separation at 200 $\mu\text{m/s}$ and 1000 $\mu\text{m/s}$ within different pillar shapes.

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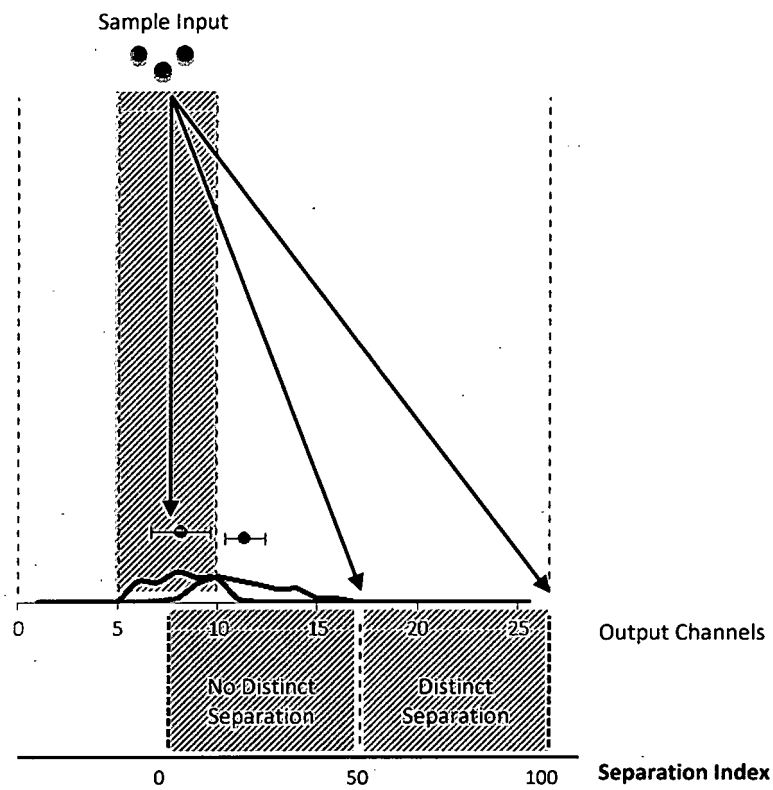


Figure 9 Scheme 1. A diagram depicting the use of separation index for describing the separation strength

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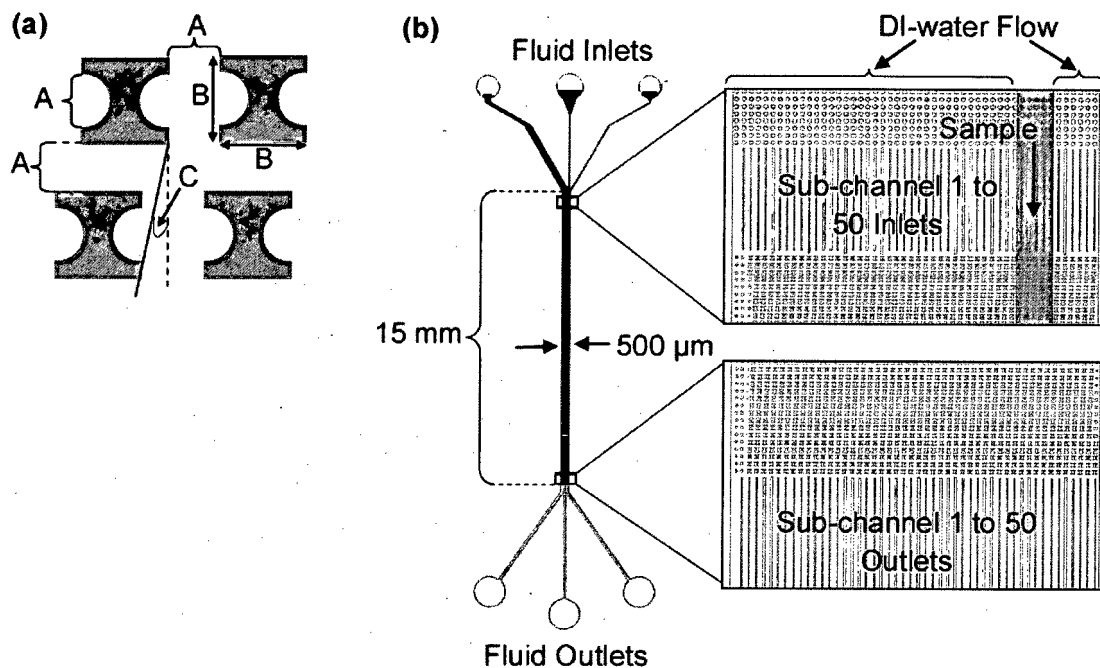


Figure 10 Scheme-2: Schematics for bacterial separation by I-shaped pillar array: (a) Dimensions of I-shaped pillars and different array components, where $A=4\ \mu\text{m}$, $B=6\ \mu\text{m}$ and $C=2.0^\circ$ or 1.6° . (b) The layout of the microfluidic device containing I-shaped pillar array.

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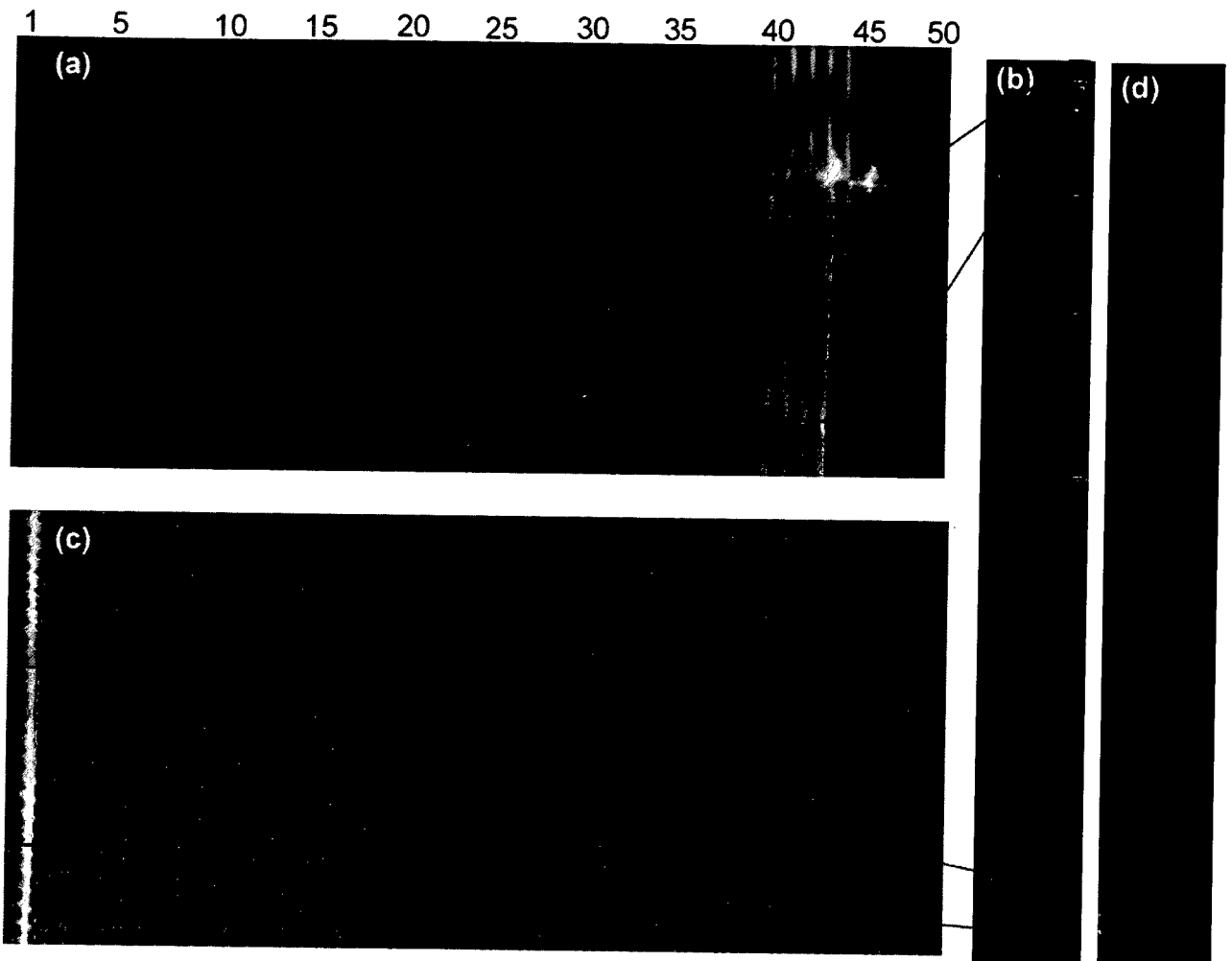


Figure-11: Bacterial separation study: Optical and fluorescence images to show the separation of bacteria (green fluorescent *E. coli*) from the input stream. Bacterial sample is flowed in the device containing “I” shape pillar array as shown in (a). Green fluorescence indicates bacteria in the sample. The bacteria in the sample are laterally displaced in the device using “I” shape pillar array to achieve its separation from the sample as shown in (b). Once deviated away from the original sample stream, bacteria are concentrated in a single channel as shown in (c). The deviation path as obtained for circle pillar array is shown in (d).

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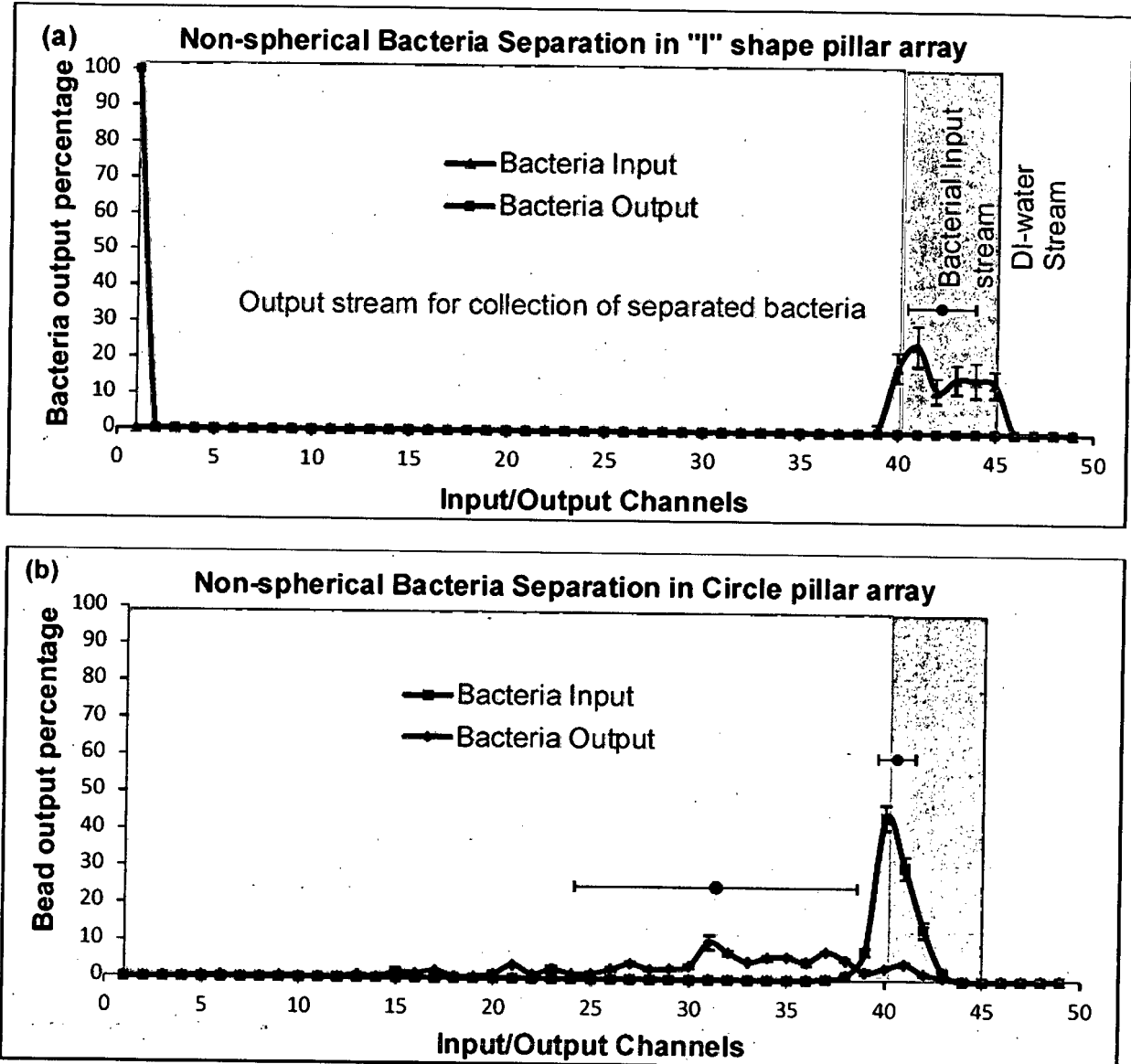


Figure-12: Non-spherical Bacterial separation through pillar arrays: percentage of bacteria in each input and output channels in (a) I-shape pillar array and (b) circle pillar array. The shift gradient is 2° for pillar arrays used here. Horizontal error bars represents the standard deviation from channel mean.

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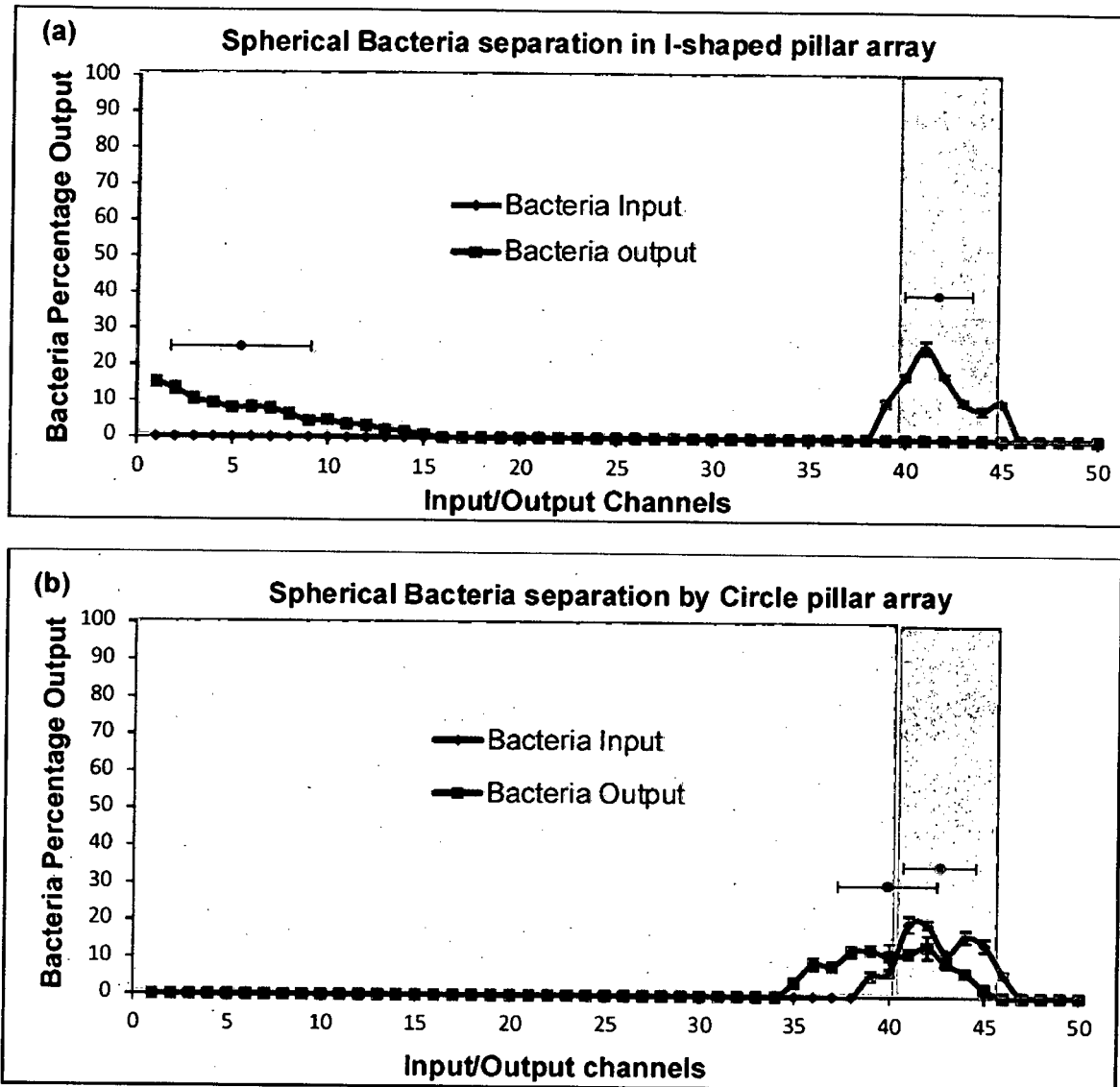


Figure-13: Spherical Bacterial separation through pillar arrays: percentage of spherical bacteria in each input and output channels in (a) I-shape pillar array and (b) circle pillar array. The shift gradient is 1.6° for pillar arrays used here.

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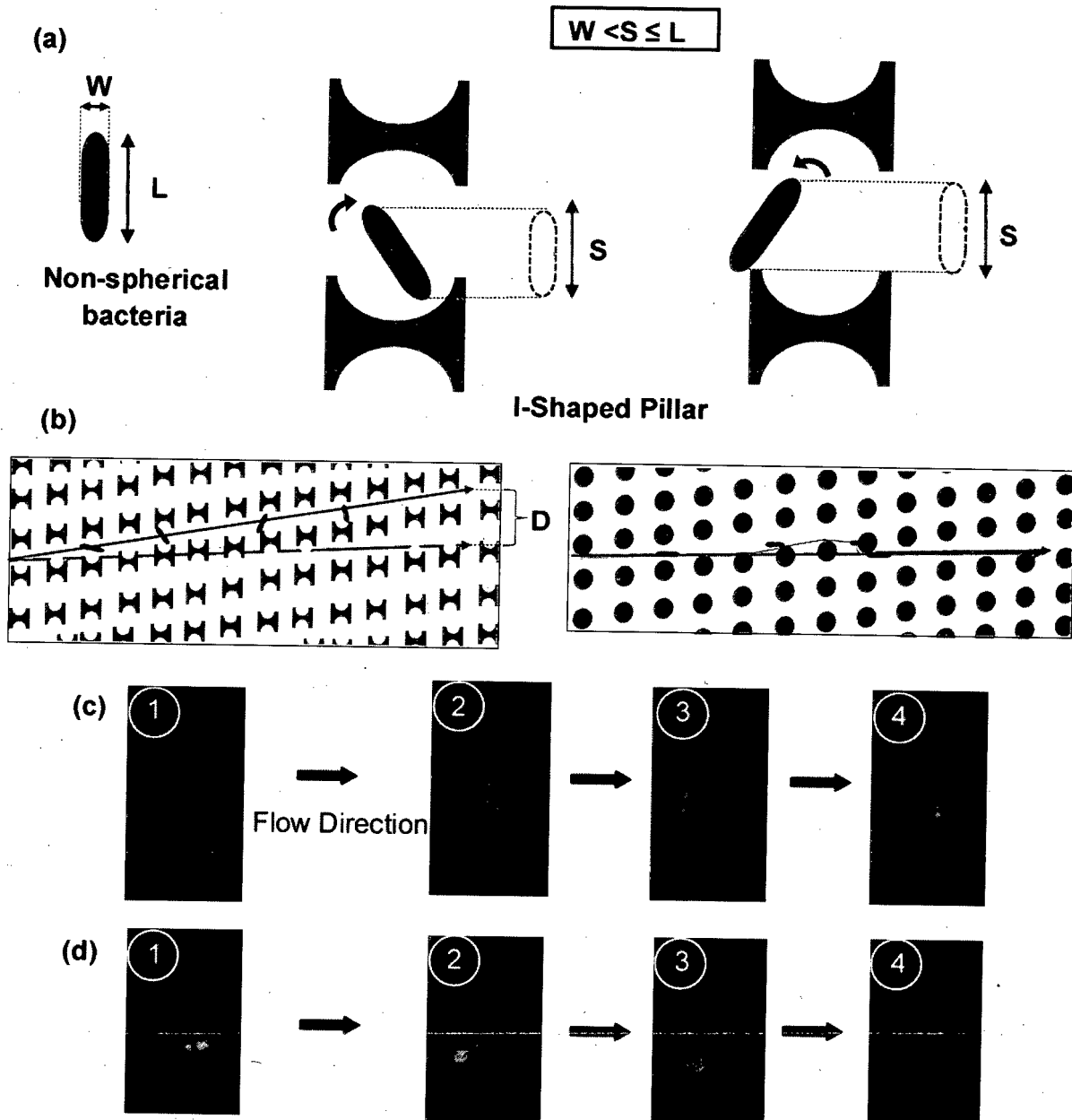


Figure-14: Bacterial movement in I-shape pillar array: (a) shows the schematic of non-spherical bacteria and its different orientations arising due to seesaw movements in I-shaped pillar array. Width and length of the bacteria is denoted by "W" and "L" respectively and the effective separation size is denoted by "S". (b) The schematics to show movement of bacteria through I-shaped and circular pillar array. Green and Red arrows indicate the path of bacteria and fluid respectively. Bacteria moves along the pillar gradient for I-shaped pillar array and laterally displaced by the displacement "D", whereas there is no displacement for circular pillar array. The movements of a bacterium is shown here for (c) I-shape pillar array obtained from Movie-1 (SI) and (d) for circle pillar array obtained from Movie-2 (SI). Images presented here are top-views.

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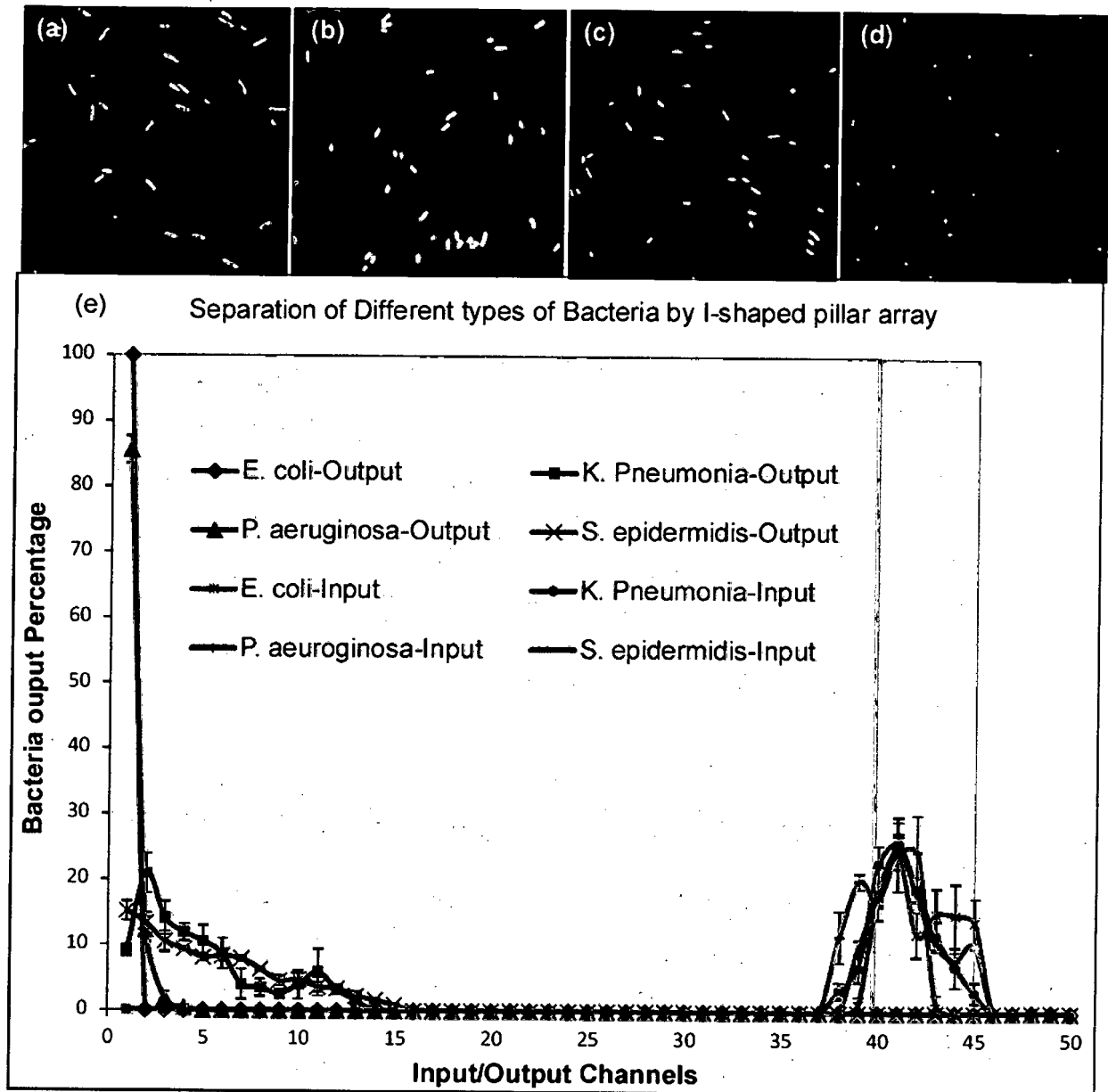


Figure-15: Separation of different species of bacteria: (a-d) shows fluorescence images of different types of bacteria, (a) *E. coli*, (b) *K. Pneumoniae*, (c) *P. aeruginosa* and (d) *S. epidermidis*. (e) The plot above shows the percentage distribution of different species of bacteria in different input and output indicating their separation from input stream to output stream.

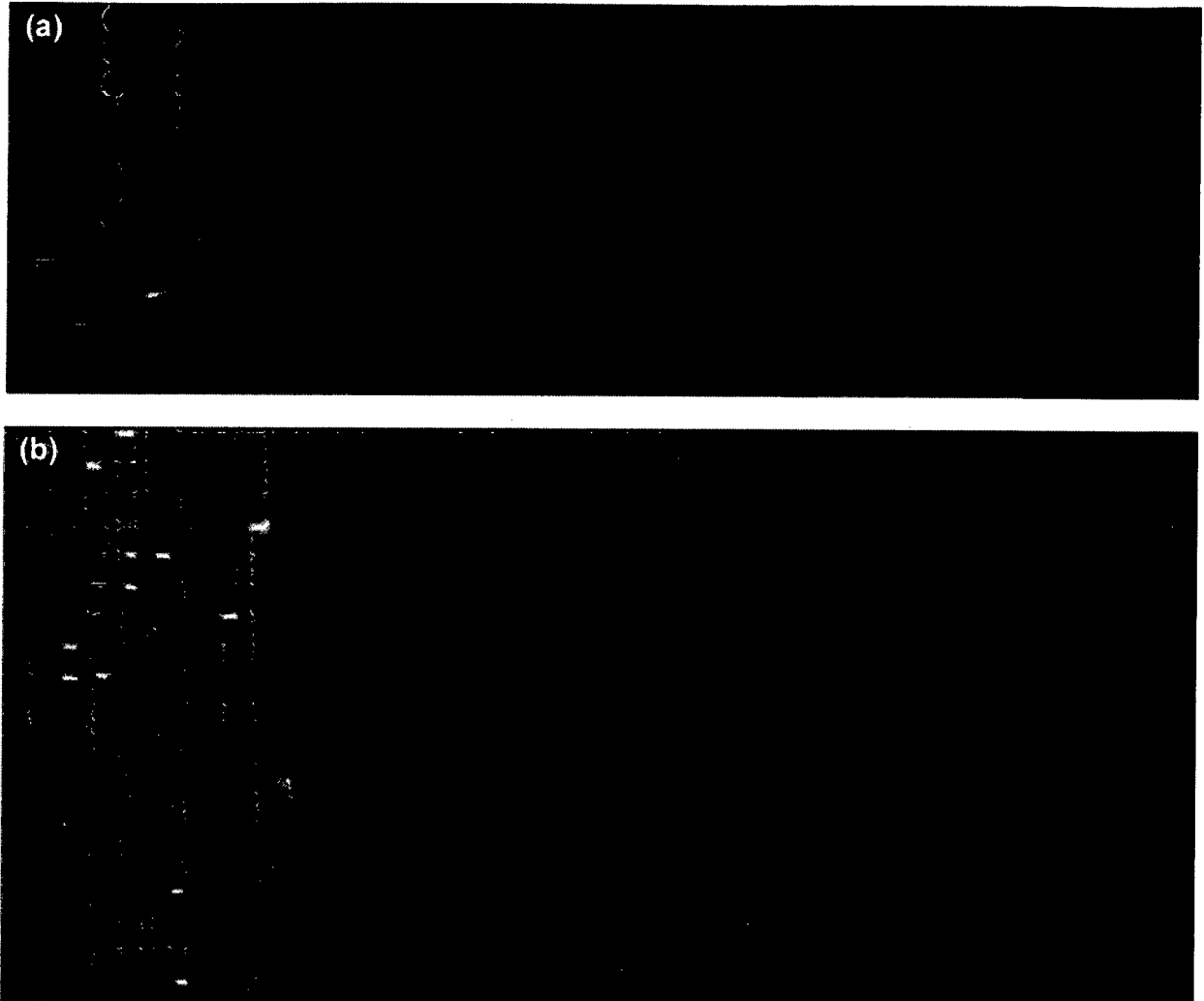


Figure-16: Separation of bacteria from blood: The bacteria in the sample are separated from blood cells using “I” shape pillar array with different bigger critical dimension. (a) shows the input sample stream containing bacteria (green fluorescent streaks) in blood (red circle indicated a single RBC). (b) shows the separation of bacteria and blood cells due to lateral displacement of blood cells while bacteria maintain its path. The dimension for this device was chosen in such a way that it deviates blood cells but not bacteria.