micromachines

Supplementary Materials: High-Throughput Particle Concentration Using Complex Cross-Section Microchannels

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Calculation of Focusing Number of Complex cross-section (FNC):

The FNC number of the spiral microchannel can be obtained as follows:

$$FNC = \cot\alpha \,.\frac{W_R}{W_T} \tag{S-1}$$

Where α is the angle between sloping side and the horizontal line, w_R is the devoted width to the trapezoidal shape, and w_T is the devoted width to the rectangular shape. The value of FNC affects the threshold of sample flow rates to start the de-focusing of particles from equilibrium positions and moves to the higher flow rates within microchannel with large amount of FNC.

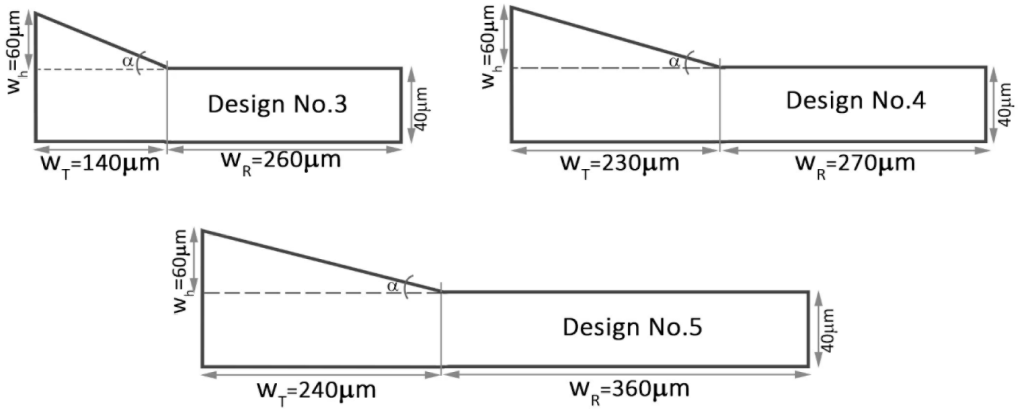

Figure S1. Schematic of complex cross-sectional channels illustrating dimensional characteristic.

The FNC number of complex cross-sectional channels can be estimated as follow:
Channel Design No. 3:

$$FNC = \cot\alpha \,.\frac{W_R}{W_T} \tag{S-2}$$

$$FNC = \frac{140}{60}.\frac{260}{140} = 4.3 \quad \text{(S-3)}$$

Channel Design No. 4:

$$FNC = \cot\alpha\,.\frac{W_R}{W_T} \quad \text{(S-4)}$$

$$FNC = \frac{230}{60}.\frac{270}{230} = 4.5 \quad \text{(S-5)}$$

Channel Design No. 5:

$$FNC = \cot\alpha\,.\frac{W_R}{W_T} \quad \text{(S-6)}$$

$$FNC = \frac{240}{60}.\frac{360}{240} = 6 \quad \text{(S-7)}$$

The FNC number can be written as

$$FNC = \cot\alpha\,.\frac{W_R}{W_T} = \frac{W_T}{W_h}.\frac{W_R}{W_T} = \frac{W_R}{W_h} \quad \text{(S-8)}$$

Therefore, regarding (S-8), the FNC can be obtained as

$$FNC = \frac{W_R}{W_h} \quad \text{(S-9)}$$

The above formula can be considered for complex cross sectional channels, combination of trapezoidal and rectangular sections.