Compact and Low-cost Flow Cytometry Unit for Monitoring Particles in Water

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We have been developing a compact and low-cost flow cytometry unit (Figure 1) suitable for a variety of water monitoring needs. We have been developing an integrated flow cytometry chip, which comprises a pre-treatment part and a sheath flow-forming part with a twisted microchannel structure, biological cells were successfully detected at the proposed chip [1][2]. We constructed a compact and low-cost monitoring unit with a light emitting diode (LED) based optical setup. In this presentation, we introduce the compact and low-cost flow cytometry unit and demonstrate the ability to measure the particles.

Figure 2 shows a schematic of flow cytometry chip and an image of the twisted flow cytometry chip. Figure 3 shows a photograph of the fabricated chip. The flow cytometry chip made of Polydimethylsiloxane (PDMS) and the sheath flow-forming part is twisted by 180 degrees (°). The length of the sheath flow channel was designed to be twisted by 90° at second junction and the sheath flow was formed. Figure 4 shows a schematic of the optical setup. A laser and a PMT of the conventional optical setup were changed to the LED and the optical sensor in the new setup. We assessed the detecting ability of the compact and low-cost flow cytometry unit using standard fluorescent particles.

Figure 5 shows a photograph of the compact and low-cost flow cytometry unit. The unit is a 60 mm cubic. Water including the fluorescent particles was used as the sample fluid. The flow rates of the sheath fluid and the sample fluid were set to 0.10 μl/sec and 0.017 μl/sec, respectively. The mean flow velocity at observation point is 1.3 mm/sec. Figure 6 shows the signals from particles. The signals of particles were successfully detected using the LED based optical setup.

In summary, we constructed the compact and low-cost flow cytometry unit for monitoring particles in water and the signal of particles were successfully detected.

Word Count: 314

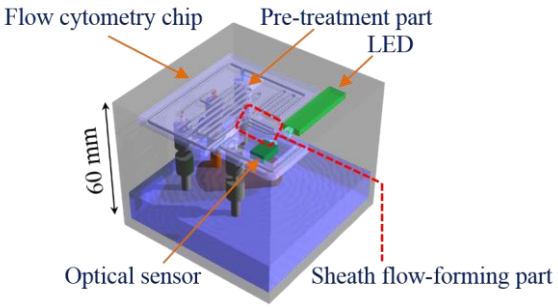

Fig. 1 Schematic of the flow cytometry unit.

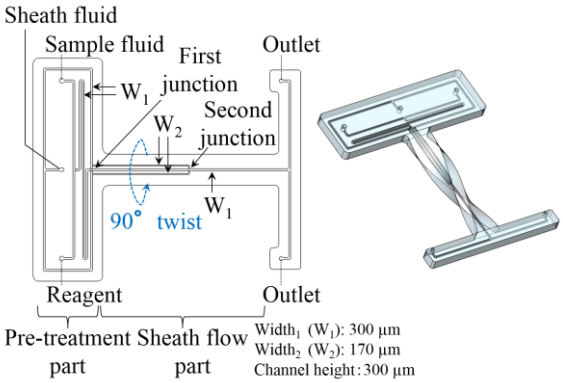

Fig. 2 Design of the flow cytometry chip. $Width_1$ (W_1) : 300 µm, $Width_2$ (W_2) : 170 µm, Channel height : 300 µm.

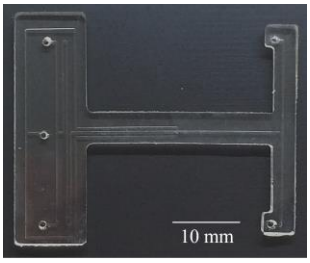

Fig. 3 Photograph of the fabricated chip.

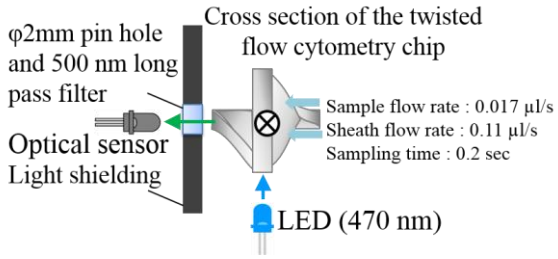

Fig. 4 Schematic of the LED based optical setup.

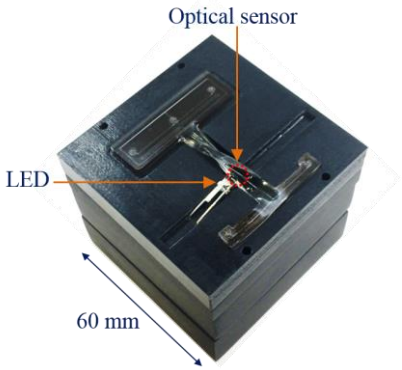

Figure 5 Photograph of the flow cytometry unit.

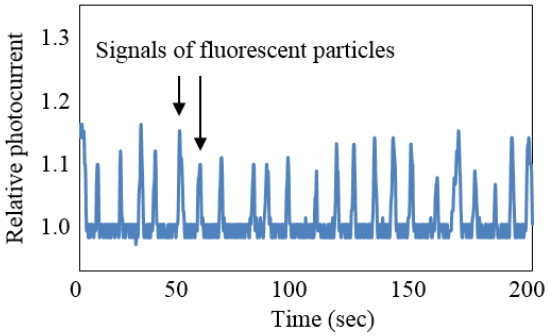

Fig. 6 Signal from particles by using the flow cytometry unit.

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