

UV LED excited time-gated luminescence flow cytometry: inexpensive, portable and accurate flow cytometer for rapid micro-organisms real-time counting

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Backgrounds:

Flow Cytometry is a process in which scattering or fluorescence measurements are made of cells or particles as they pass, preferably in single file, through a measuring apparatus in a fluid stream. Flow cytometers identify and enumerate specified cells at rate of 1000 to 40,000 cells per second continuously. The cost of these instruments ranges from US\$ 20,000 to 125,000, because multiple high-cost lasers and detectors are required to distinguish real fluorescent signal from the autofluorescence background.

We present the concept and experimental evaluation of a UV LED excited pulsed flow cytometer suitable for ultra-low background rapid counting of individual rare-event microorganisms previously labeled with long-lived fluorescence markers.

Outcomes:

- Real-time identification and quantitation of individual targeted 'fluorescence' cells in flowing stream at potential speed of several thousands of cells per second.
- Inexpensive (< \$5,000) portable cytometer allowing accurate counting of specified microorganisms, like water pathogens, blood lymphocyte CD4, or other bacterias in milk, food or beverage industries.

Project Progress:

1. The theoretical concept was developed
2. The prototype flow cytometer was constructed.
3. Electronics was developed for data acquisition, and the signal was analyzed in real-time via a programmed PC software.
4. ~5 μm europium luminescence beads in environmental water concentrate were counted as efficient as 100%.

Expected collaborations:

We would like to collaborate with both academic and commercial partners to explore potential applications in clinical areas, like cancer cells and blood cells enumerations or other bacteria real-time monitoring in milk, food or beverage industries.

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