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A gravity-induced flow injection system for surface plasmon resonance biosensor

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Abstract

A number of portable surface plasmon resonance (SPR) devices have been developed for point-of-care (POC) testing. Meanwhile, micropumps have been fabricated to be integrated into these devices for flow injection analysis (FIA). However, the (micro) pumps, the tubes and their external control units were space-consuming. Here we developed a power-free flow injection analysis (FIA) method for SPR detection based on a gravity-induced flow injection (gFI) system. The gFI system was tubeless and did not need to be controlled. The fluid was driven into the detection areas by its own gravitational force. A transition channel was used to increase the liquid-level difference between the inlet reservoir and the outlet reservoir. After a liquid sample was placed in the inlet reservoir, the flow rate of the liquid sample was increased in the transition channel. Before it arrived at the sensing surface, the flow rate of the sample was steady (with an error of less than 10%). The fluctuation of the flow rate had an influence on the SPR response signal, which was successfully denoised using an internal reference. With the gFI system, the SPR imaging biosensor was able to perform real-time detection manually. The SPR responses of DNA hybridization and protein immobilization were successfully