Microchip electrophoresis with chemiluminescent detection and its possible application to environmental analytical chemistry

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In this present work, the principle of microchip technology was briefly described. A glass microchip was designed on the base of flow injection-chemiluminescent devices and fabricated by standard photolithography technology, wet chemical etching and heat bonding technology. The preparation of microchip electrophoretic systems utilizing polyester with in-situ polymerization method was also introduced [1, 2]. Four different detection methods, chemiluminescence [2, 3], LED induced fluorescence [4], absorption and amperometric detection [5] were compared in our laboratory. As the examples, trace amount of Cu$^{2+}$, Co$^{2+}$ and Ni$^{2+}$ were separated and detected with chemiluminescent method on the chip. The detection limits of Cu$^{2+}$, Co$^{2+}$ and Ni$^{2+}$ can be obtained to 5.0x10$^{-9}$, 5.0x10$^{-11}$ and 1.0x10$^{-7}$ mol/L, respectively. Dopamine and catechol were separated and detected using a permanganate chemiluminescent system on the prepared microchip. The samples were electrokinetically injected into the double-T cross section, separated in the separation channel, and then oxidized by chemiluminescent reagent delivered by a home-made micropump to produce light in the detection cell. The detection limits for dopamine and catechol were 20.0 µM and 10.0 µM, respectively. Successful separations and detections of metal ions, organic compounds demonstrated the distinct advantages of integration of chemiluminescent detection on a microchip for rapid and sensitive analysis.

References