

## Development of a Simple and Compact Fluorometric Detector and Its Application to Sequential Injection Analysis

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### Summary

Spectrophotometric determination methods are widely used to analyze various components in various samples. Although spectrophotometric determination is relatively simple, its low sensitivity and severe interference from matrices often necessitate some extraction methods or masking reagents. In this study, we have developed a simple and compact fluorometric detector to attain higher sensitivity and better tolerability to interference compared to a spectrophotometric detector. A simple flow based system which can greatly simplify the procedure of determination, has also been developed. As analytes, selenium (IV) and boron were selected, and the analytical performance of the system has been tested.

The fluorometric detector developed used an ultraviolet light-emitting diode (UV-LED) as a light source and a photodiode (PD) as a light detector, with an integrator circuit for photocurrent to improve the sensitivity. Its dimensions are 125×90×60 mm, and the mass is 400 g. According to the analyte of interest, an LED and a band-pass filter in front of the PD are exchanged to obtain optimal excitation ( $\lambda_{\text{ex}}$ ) /emission ( $\lambda_{\text{em}}$ ) wavelengths for the determination.

In the case of Se (IV) determination, 2,3-diaminonaphthalene was used as a fluorometric reagent, and the fluorescence was measured at  $\lambda_{\text{ex}}$  of 375 nm and  $\lambda_{\text{em}}$  of 550 nm. The detection limit calculated from  $3\sigma$  of blank was  $1.2 \mu\text{g L}^{-1}$ . In the case of B determination, chromotropic acid was used, and  $\lambda_{\text{ex}}$  of 315 nm and  $\lambda_{\text{em}}$  of 360 nm were used. The detection limit was  $46 \mu\text{g L}^{-1}$ . The sensitivities for both Se (IV) and B are high enough to be applied to samples containing the analytes less than environmental quality standards.

The flow system was build using micro pumps, (3 cm in length, operated by 3 V power supply) . It was applied to the flow analysis of B with the same reagents as the previous batch measurement. In spite of its simple design, a clear flow signal of B could be obtained, and the detection limit was  $34 \mu\text{g L}^{-1}$ . This system was applied to the determination of B in river water samples. The results were of good agreement with those obtained by an atomic emission spectrometer.

We will develop a sequential injection system which is suitable for intermittent analysis, and apply it to various analytes.