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Flow Injection Analysis for Boron Determination by Using Methyl Borate Generation and Flame Atomic Emission Spectrometry

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Abstract: Boron is one of the least sensitive elements in atomic emission spectrometry. As various refractory substances interfere in the analysis and because of the low sensitivity, sample enrichment and the separation of the interfering matrix is needed. Methyl borate has many advantages because of its simple generation conditions and its stability in the absence of moisture. New procedures for the generation of methyl borate without using external heating have also been investigated to produce a more rapid determination of boron. The on-line combination of flow injection analysis using methyl borate generation with flame atomic emission spectrometry as the detector is proposed to provide sufficient enrichment factors in order to determine boron in different matrices. In order to obtain as much moisture-free medium as possible, all standard solutions were prepared in 60% H_2SO_4 (v/v) according to the experimental results. The effect of Ar flow rate, peristaltic pump rate, size of the tubings used, and length of the mixing coil to the emission signal were all studied. Furthermore, the design of the gas liquid separator, and several ways to transfer the signal to AES were also examined in detail. A linear calibration graph was obtained between 10 and 2000 \μ g/mL with the equation y = 0.1105X - 1.496 . The detection limit of the method was calculated as (3S) 2.96 \μ g/mL or 0.74 \μ g B.

Key Words: Boron, AES, Methyl borate formation, flow injection.

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