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Determination of Fluoride in Salts Using Capillary Zone Electrophoresis

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Summary

We developed capillary zone electrophoresis (CZE) with indirect UV detection for determination of fluoride (F^-) in salts using transient isotachophoresis (tITP) as an on-line concentration procedure. The proposed method is simple: it requires no sample pretreatment. The following optimum conditions were established: a polyimide-coated fused-silica capillary (75 µm i.d. and 375 µm o.d.), 62.4 cm total length and 50 cm effective length (the length from the sample inlet side of the capillary to the detector); a background electrolyte (BGE), 5 mM 2,6-pyridinedicarboxylic acid (PDC) adjusted to pH 3.5 containing 0.03% m/v hydroxypropyl methylcellulose (HPMC); detection wavelength, 200 nm; vacuum (50 kPa) injection period of sample, 1.5 s (107 nL); applied voltage, 16 kV with the sample inlet side as the cathode. A regression equation relating area response (y, peak area (arbitrary units)) to concentrations of F^- (x, 0 – 0.20 mg/L) was $y = 38.5x + 0.0817$ (correlation coefficient, 0.9975); a regression equation relating height response (y, peak height (10^{-3}a.u.)) to concentrations was $y = 17.1x + 0.167$ (0.9966). The respective values of the relative standard deviation (RSD) of the peak area, peak height, and migration time for F^- were 5.9, 7.8, and 0.12%. The limit of detection (LOD, $S/N = 3$) and limit of quantification (LOQ, $S/N=10$) for F^- respectively reached 0.022 and 0.072 mg/L. The proposed method was applied to determination of F^- in byproduct and granulated salts obtained from the Salt Industry Center of Japan. Results obtained using CZE agreed with those obtained using a conventional spectrophotometric method (lanthanum-alizarin complexion absorption spectrophotometry).