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DEDICATION

I dedicate this project to my wife, Dorcas and the children; Ashiel, Ariel and Amiel, who missed me during the course of my work. The efforts by the little kids, especially Ariel, who contributed by always plucking off computer cables, switching off power or simply crying for attention during my typing of the project cannot go unmentioned. Uncle Last and Doiline will be mentioned for the lighter moments which eased off the pressure.

ABSTRACT

The effects of excess Na and K on K and Mg atom line emission during air-acetylene flame atomic spectrometry (FAES), and of excess Li and K on Ca, Mg and Sr atom and ion lines in the inductively coupled plasma (ICP), were studied using emission signal ratios, E'/E as probes, where E' and E are the emission readings in the presence and absence of the interferent respectively. The E'/E plots as a function of analyte concentration in the test solution for the ICP experiments were similar to those obtained for the flame experiments in the analytical range of 0-10 mg/L. Two possible rate models: a simplified rate model based on analyte excitation via charge transfer between analyte ions and activated interferent atoms, and a collisional rate model based on ambipolar diffusion have been proposed to account for the emission signal enhancement observed at low analyte concentrations (<1 mg/L) for both ICP-OES and FAES. Data are presented comparing the experimental E' calibration curves and theoretical E' calibration curves computed using the simplified rate models. The collisional charge transfer model showed good agreement for analyte concentration range spanned. Empirical values of collisional de-excitation rate constants (k_{CD}) values were obtained using the ambipolar diffusion model and these values were found to vary inversely with analyte ion concentration. The results also showed that k_{CD} values were independent of interferent concentration, for the situation of high interferent/low analyte concentration.