

**Project 2: Emission spectroscopy of AA flames – search for interferent effects of complex anions.**

Atomic Absorption spectroscopy is a method traditionally used for the determination of metal ion concentrations, usually in aqueous samples, and plays an important role in water environmental chemistry [1,2]. Light from a hollow cathode lamp containing a vapor of the metal being analyzed in the sample is passed through a flame into which the sample solution is sprayed in droplets from a *nebulizer*. The absorption spectrum of the analyte metal atoms in the sample matches the emission spectrum of the hollow cathode source. A particular wavelength is chosen and absorbance measurements performed in the usual fashion, leading to values for analyte concentration.

A variety of factors affect the quality of data obtained by this method. *Molecular* emissions and absorptions are broad and complex, leading to the possibility of overlap with the atomic lines. These can be generated by the flame itself (carbon fragments), or by complexing agents or complex anions present in solution with the analyte metal ions. Other factors are the tendency of highly charged anions to reduce cation atomization, and the influence of charge state on the cation spectrum.

Methods exist to reduce the effect of some of these processes. For example, a second line from the source close to the line of interest can be used as a reference. Alternatively, some AA instruments can make use of the Zeeman interaction and polarized light to minimize interference. (Not ours, though.)

The goal of this project is to characterize the irradiance spectra of several hollow cathode sources and to study anion effects on AA cation determination using various methods. Additionally, AA flame spectra will be studied under various gas mixture/flow conditions, and computational chemistry methods will be used to identify species observed in flame spectra.

Initial references:

1. Harris, D. C., *Quantitative Chemical Analysis*, 6ed., Freeman 2003, Ch. 21.
2. Skoog, D. A. , Holler, F. J. , Nieman, T. A., *Principles of Instrumental Analysis*, 5 Ed., Brooks/Cole 1998, Ch. 9.