

## Abstract

### Title of the Thesis: "Trace And Ultratrace Scale Studies On Detection And Dynamics Of Some Fourth Period Elements"

In this thesis encompasses production, separation, detection and understanding the dynamics of both radioactive and stable isotopes of some elements from the fourth period of the Periodic Table in trace and ultra-trace scale concentration.

For the extraction methods of some elements from fourth period of the periodic table in their no-carrier-added (nca) state have been developed employing radioanalytical methodologies. In case of trace elements analysis by inductively coupled plasma optical emission spectrometry (ICP-OES), in most of the cases samples are in solution form and, therefore, sample preparation methods are designed to transform solid samples into solution. Closed-vessel microwave digestion is a popular wet acid digestion procedure to achieve this step.

An improved non-destructive method of potassium determination experiment requires neither chemical treatment of the sample nor irradiation of the sample in a nuclear reactor. The proposed method was further validated by measuring K in the SRM samples by ICP-OES and WDXRF. The total amount of K in Spinach (*Spinacia oleracea*), Red amaranth (*Amaranthus cruentus*), Green amaranth (*Amaranthus tritris*) and Jute leaves (*Corchorus olitorius*) leaves have been measured with the help of the Saha Institute of Nuclear Physics Compton suppressor spectrometry (SINP-CSS). After boiling, amount of potassium content in all leaf vegetables decreased significantly.

The liquid anion exchanger trioctylamine (TOA) dissolved in cyclohexane was employed for the separation of  $^{61}\text{Cu}$  from bulk cobalt in HCl solution. We have also reported the production and radiochemical separation of nca  $^{73}\text{As}$  and  $^{75}\text{Se}$  from  $^7\text{Li}$  irradiated germanium oxide target.

Solubility plays an important role for all chemical studies. We have studied the solubility of  $\text{GeO}_2$  in various strengths of  $\text{HNO}_3$  and  $\text{HCl}$  with the help of inductively coupled plasma optical emission spectrometry (ICP-OES). To see the uptake behaviour and interdependence study of arsenic and selenium in Mung bean, various strength of As(III) and Se(IV) solutions were added to the medium. We have shown that the concentration of As and Se in root and shoot part in a common plant, Mung (*V. radiate*) shows migration and bio-magnification behaviour of As and Se to human body.

Ajoy Mandal.