STUDIES ON SELECTIVE PARTICULATES POLLUTANT AT TRACE LEVEL IN ENVIRONMENTAL MATRICES USING ATOMIC ABSORPTION SPECTROPHOTOMETRY

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ABSTRACT

Present work characterises on low level detection of Aluminium. For routine blood analysis especially for kidney dialysis patients wherein Al contamination becoming a major problem, this detection is of much importance. A.A.S. has been used for the determination of Aluminium along with a few other trace metals in a variety of environment samples. The reliability of estimation further assessed through the standard reference materials. The results indicates the average concentration of aluminium in air particulate samples in 3.9 mg/m$^3$.

Key Words: A.A.S., Analytical technique, Air particulate, Detection Limit, Toxic effects

INTRODUCTION

Every person's health depends on quality of water and air and the nations economy and prosperity too. Entire world is facing the problem of nature imbalance associated with existing chronic problems of natural calamities. Pollution is the ultimate result of the natural imbalance. Besides major contributor of pollution there are a few hazardous elements present in trace amounts. eg. Al, Hg, Cu, Ni, etc. Pb causing anaemia, Nervous problem, kidney disorder. Due to potential toxic effects of aluminium during recent years it became the subject of interest. One of the potential source of additional dietary aluminium is aluminium cookware, foils and wrappers. As compared to coffee, tea has been reported as richer source of aluminium. Living beings essential requisites of air, water and food contain trace amounts of a wide range of trace metals. Some of them are essential for biological and several biochemical processes, others are toxic. Aluminium is wide spread throughout environment air, water, plants and consequently in all the food chain. It enters in the food chain through a number of natural and anthropogenic sources. Acid rain decreases the pH in soil, permitting aluminium mobility through ground water by increasing its bio availability which increases the interest in dietary intake studies. Al is added to drinking water as its sulphate at treatment plant to flocculate the organic matter and to clarify the water.

Its determination presents numerous problems like sensitivity and selectivity of the method and additional contamination risk during the analytic process. Due to very low
concentration in a variety of environmental samples its detection requires the use of an accurate analytical technique with sufficient sensitivity.

**MATERIAL AND METHODS**

Several Modern analytical methods have attained the capability of measuring most of the elements including heavy metals like Hg, Cr, Pb, Zn, Ni, Mn at sub- mg/g levels. Here an attempt has been made to detect Al at trace level as toxicant using Atomic Absorption Spectrophotometer (Parkin Elmer Analyst).

All the samples of air particulate were collected for one day duration using high volume sampler. Samples collected were wet digested with a mixture of Hydrochloric acid, Nitric acid and Perchloric acid. In order to study aluminium in water, various samples were collected from different areas of city (about 15 samples).

All chemicals used were of E-Merck, Analar grade. Standard stock solution (.01M) was prepared and when necessary dilutions were also made. For the collection, decomposition and storage of sample prior to analysis, high purify polythene containers have been used. All the laboratory wares used for the collection, decomposition, storage, analysis, ashing were soaked in 10% HNO₃ for few days and then rinsed with double distilled water.

The level of aluminium in environmental samples have been estimated by AAS. The level have been determined by calibration and by standard addition method standard addition curve for different sampler were also drawn.

**RESULTS AND DISCUSSION**

The reported data in based upon a number of measurements. The mean concentration of aluminium in air particulate and drinking water samples along with range are shown in Table.

<table>
<thead>
<tr>
<th>No.</th>
<th>Matrices</th>
<th>No. of Samples</th>
<th>Concentration of Al</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Air particulate</td>
<td>6</td>
<td>0.9</td>
<td>6.5</td>
</tr>
<tr>
<td>2.</td>
<td>Drinking Water samples</td>
<td>15</td>
<td>0.02</td>
<td>0.9</td>
</tr>
</tbody>
</table>

The aluminium level in air particulate samples were found to vary from 0.9 to 6.5 µg/m³ with a mean value of 3.9 mg/m³ about 70% of samples have aluminium level below 3 µg/m³.

WHO comfortable limit for Al in drinking water is 0.12 mg/ml. The Al level in drinking water samples ware found to be 0.7 mg/ml, which is lower than WHO limit for Al. Daily dietary intake of Al was also calculated and its concentration in different biological matrices were also reported by different scientist.

By analysing aluminium in synthetic samples containing different elements like Pb, Cd, Cu, Zn, Co, Ni etc. the precision of the procedure was established. The recovery of Al content was established by determining the added aluminium content in synthetic samples.

**CONCLUSION**

Fine particulate matter of size less than 10m have been identified as critical pollutant causing potential health hazard for human being. The recovery studies indicate that its recovery is quantitative and no interference is observed due to presence of other elements. Results of analysis of standard reference materials, agree with certified values indicating the accuracy and precision of the method. Accepted level of Al by ICP-MS for Al is 3.08 mg/ml in drinking water.

Due to extensive use persistent foil, wrappers in daily life, Al accumulate in
environment and exert toxicological constraints and physiological stress on life form.

REFERENCES


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