

## TRACE ELEMENT CHARACTERISATION OF ALUMINIUM WIRES BY NEUTRON ACTIVATION ANALYSIS

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### Abstract

*A study has been made to evaluate the usefulness of trace element characterisation of aluminium wires by NAA, for forensic applications. Levels of Mn, Cu, Ga, La, Sm, Cr, Fe, Hf and Se were determined by NAA, along different lengths of two long wires. The results reveal uniformity of distribution with respect to these elements. This method has been utilised to examine the trace element profile (TEP) of 17 different aluminium wires. Pattern recognition technique was applied to the data set of 9 trace elements on 30 samples, for an objective way of classification. These studies could be utilised in the investigation of aluminium wire theft cases or any other case where the comparison of samples for their source correspondence is required.*

### Introduction

Aluminium metal is used extensively as electrical transmission wire. The increased price and demand of the metal result increased menace of theft from transmission lines (1,2). The forensic examination is required to find out whether the questioned and control wires have a common source of origin (3). Determination of physical properties like diameter, density and resistance can only establish gross similarity between them. No opinion can be made regarding their source correspondence to prove in the court of law.

Electrical grade high purity aluminium produced from alumina by electrolysis is used as electrical conductor or for commercial purpose. The purity of electrical grade aluminium is more than 99% and a number of elements are known to be present as trace impurities. But there is every possibility that the ultimate product from the same source would show similar trace element profile (TEP) whereas samples from different sources would show dissimilar TEP.

The usefulness of TEP in the comparison of copper wires has been demonstrated by Singh and Singh (4). Spectrographic analysis of aluminium wires by Singh, Sethumadhavan and Omanakutty (5) also indicates the feasibility of characterisation of different wires by comparison of their TEP.

This paper presents an attempt on characterisation of aluminium wire samples through their TEP, applying neutron activation analysis. Trace element

# Neutron Activation Analysis For Clinical Trace Element Research

**K. Heydorn**



## **Neutron Activation Analysis For Clinical Trace Element Research:**

*Neutron Activation Analysis for Clinical Trace Element Research* K. Heydorn, 1984      **NEUTRON ACTIVATION ANALYSIS VOLUME II** K. Heydorn, 1984-04-05      **Neutron Activation Analysis for Clinical Trace Element Research** K. Heydorn, 1984      **Trace Element Analysis in Biological Specimens** R.F.M. Herber, M. Stoeppler, 1994-05-19 The major theme of this book is analytical approaches to trace metal and speciation analysis in biological specimens The emphasis is on the reliable determination of a number of toxicologically and environmentally important metals It is essentially a handbook based on the practical experience of each individual author The scope ranges from sampling and sample preparation to the application of various modern and well documented methods including quality assessment and control and statistical treatment of data Practical advice on avoiding sample contamination is included In the first part the reader is offered an introduction into the basic principles and methods starting with sampling sample storage and sample treatment with the emphasis on sample decomposition This is followed by a description of the potential of atomic absorption spectrometry atomic emission spectrometry voltammetry neutron activation analysis isotope dilution analysis and the possibilities for metal speciation in biological specimens Quality control and all approaches to achieve reliable data are treated in chapters about interlaboratory and intralaboratory surveys and reference methods reference materials and statistics and data evaluation The chapters of the second part provide detailed information on the analysis of thirteen trace metals in the most important biological specimens The following metals are treated in great detail Aluminium arsenic cadmium chromium copper lead selenium manganese nickel mercury thallium vanadium and zinc The book will serve as a valuable aid for practical analysis in biomedical laboratories and for researchers involved with trace metal and species analysis in clinical biochemical and environmental research      **Activation Analysis** Zeev Alfassi, 1990-06-22 This timely publication covers prompt measurements as well as delayed activation measurements used in chemical analysis of the elements It describes the various possibilities of activation neutrons charged ions and photons Also discussed are the advantages and disadvantages of each activation method These volumes are important for those in geology archaeology biology analytical chemistry radioanalytical and nuclear chemistry the semiconductor industry and others      **Journal of Research of the National Bureau of Standards** United States. National Bureau of Standards, 1986      **Elemental Analysis of Biological Systems** G. Venkatesh Iyengar, 1989-05-31 The purpose of this volume is to emphasize the fact that biological trace element research is a multidisciplinary science which requires a prudent combination of biological insight and analytical awareness The text frequently stresses that accurate measurements on biologically and analytically valid samples hold the key for success in future investigations It reminds the analytical scientists and the life sciences researchers that their perceptions should extend beyond conventional limits namely the former as generators of data and the latter as interpreters of those findings This book enables the reader to understand the intricacies of elemental composition studies in biological systems and also

provides a valuable source of information to biologists biochemists physicians nutritionists and related scientific workers who intend to draw meaningful conclusions from the analytical findings      **Element Analysis of Biological Samples G.**

Venkatesh Iyengar,K. S. Subramanian,Joost R.W. Woittiez,2020-11-25 Despite the development of innovative new analytical techniques for biological trace element research today s trace element investigators face formidable obstacles to obtaining reliable data This complete reference identifies and assesses the challenges the analyst encounters at each stage of an analysis and discusses the effects of various techniques on the sample Three internationally recognized scientists and authors consider the effects of the numerous collection storage and sample preparatory techniques used in sample analysis Proper analytical quality control including such critical factors as sampling and sample preparation specimen preservation and storage and ashing is examined The book also looks at sample preparation methods unique to various instruments and speciation chemistry issues and examines the link between chemical analysis and specimen banking A previously unrecognized source of error presampling factors is also discussed      **Nuclear Analytical Methods in the Life Sciences**

Rolf Zeisler,Vincent P. Guinn,2012-12-06 The book is very readable and serves as an excellent reference source for research in the fields of analytical methodology and application for a wide range of biological medical and environmental samples a very good compilation of technical papers Analyst      **Nuclear Analytical Methods in the Life Sciences 1994** Jan

Kucera,Ivan Obrušník,Enrico Sabbioni,2013-06-29 Nuclear Analytical Methods in the Life Sciences 1994 is a forefront survey of key presentations from the 1993 International Conference on Nuclear Analytical Methods in the Life Sciences Sponsored by the International Atomic Energy Agency IAEA this useful volume covers the spectrum of multidisciplinary research on both the methodological aspects and the development of nuclear analytical methods and their applications in the life sciences The book is divided into six sections covering related material These sections are Methodology of Nuclear Analytical Methods Environmental Applications Biomedical Applications Analysis of Biological Samples Quality Assurance and Comparison with Other Methods and a section dealing with miscellaneous issues such as programs offered by the IAEA      Measurement and Detection of Radiation Nicholas Tsoulfanidis,Sheldon Landsberger,2021-09-15 As useful to students and nuclear professionals as its popular predecessors this fifth edition provides the most up to date and accessible introduction to radiation detector materials systems and applications There have been many advances in the field of radiation detection most notably in practical applications Incorporating these important developments Measurement and Detection of Radiation Fifth Edition provides the most up to date and accessible introduction to radiation detector materials systems and applications It also includes more problems and updated references and bibliographies and step by step derivations and numerous examples illustrate key concepts New to the Fifth Edition Expanded chapters on semiconductor detectors data analysis methods health physics fundamentals and nuclear forensics Updated references and bibliographies New and expanded problems

Detection of Radiation Nicholas Tsoulfanidis,Sheldon Landsberger,2021-09-15 As useful to students and nuclear professionals as its popular predecessors this fifth edition provides the most up to date and accessible introduction to radiation detector materials systems and applications There have been many advances in the field of radiation detection most notably in practical applications Incorporating these important developments Measurement and Detection of Radiation Fifth Edition provides the most up to date and accessible introduction to radiation detector materials systems and applications It also includes more problems and updated references and bibliographies and step by step derivations and numerous examples illustrate key concepts New to the Fifth Edition Expanded chapters on semiconductor detectors data analysis methods health physics fundamentals and nuclear forensics Updated references and bibliographies New and expanded problems

**Elemental Analysis of Airborne Particles** Marsha Creatchman,2024-12-06 An increased standard of living in

developed and developing countries has brought about a distinct rise in pollution The problem of air pollution has specifically increased the public's awareness of the environmental and health related consequences resulting from modern day industrial technology This detailed collection of works devoted to the most popular methods in elemental analysis of airborne particles offers investigators a comprehensive book on the most common laboratory analytical methods currently used in trace element analysis Discussed are atomic absorption spectrometry inductively coupled plasma atomic emission particle induced gamma ray analysis particle elastic scattering and Rutherford backscattering and neutron activation analysis Specific sections on quality assurance quality control and source receptor modeling have also been included

**Nuclear Science Abstracts**, 1975      Energy Research Abstracts, 1989      Chromium Desmond Burrows, 2019-06-18 Published in 1983 Chromium is important in medicine because of its widespread use about 400 000 tons are processed in the U S each year toxicity carcinogenic effect and its high sensitization index in low concentration      **Cumulated Index Medicus**, 1971

Physical Methods for Inorganic Biochemistry John R. Wright, Wayne A. Hendrickson, Shigemasa Osaki, Gordon T. James, 2012-12-06 This volume is intended for students and professionals in diverse areas of the biological and biochemical sciences It is oriented to those who are unfamiliar with the use of physical methods in studies of the biological elements We hope the reader will find the material a helpful reference for other volumes of this series as well as the general literature and some may see ways to adopt these techniques in their own pursuits Every effort has been made to avoid an abstruse presentation It should be clear that one individual cannot be expert in all the disciplines considered here and the authors recognize that fact with sincere humility As may be expected of an introductory reference most of our attention was focused on the commonly used methods To balance this we have included a few examples of approaches which are promising but relatively undeveloped at this time Also an emphasis has been placed on element selectivity It is impossible to envision the course of future events and a volume which deals with instrumentation is especially prone to become outdated Nevertheless any valid approach to a scientific question should be applicable indefinitely      *Biological Monitoring of Toxic Metals* Thomas W. Clarkson, Lars Friberg, Gunnar F. Nordberg, Polly R. Sager, 2012-12-06 This document is the result of a conference on Biological Monitoring of Metals held in Rochester June 2-6 1986 organized jointly by the Environmental Health Sciences Center of the School of Medicine and Dentistry of the University of Rochester NY and the Scientific Committee on the Toxicology of Metals within the International Commission on Occupational Health ICOH at the Karolinska Institute and the National Swedish Institute of Environmental Medicine and the University of Umea Sweden The aim of the Conference was to define and evaluate the scientific basis for the biological monitoring of metals The conference was co sponsored by the World Health Organization through its International Program on Chemical Safety and received substantial encouragement and support from the Swedish Work Environmental Fund and the United States Environmental Protection Agency This was the second conference organized jointly by the Scientific Committee on the Toxicology of Metals and The Toxicology Division of

the University of Rochester The previous joint conference was held in 1982 on the Reproductive and Developmental Toxicity of Metals In addition conferences have been organized by each group see Appendices A and B Several of these conferences are specially relevant to the topic of the current conference These include the joint conference mentioned above and the conferences on dose effect and dose response relationship held in Tokyo in 1974 and on accumulation of metals held in Buenos Aires in 1972

**NEUTRON ACTIVATION ANALYSIS VOLUME II** K. Heydorn, 1984-04-05 Instrumental Multi-Element Chemical Analysis Z.B. Alfassi, 2012-12-06

The analysis of materials containing several elements used to be a difficult problem for analytical chemists so a well established sequence of wet chemical qualitative tests were performed to ensure each element was detected Quantitative tests could then be carried out on the sample according to the range of elements present Most analytical chemists were very familiar with these techniques having been taught them from a very early stage in their education and careers The analytical chemist can now call on a range of specialist instrumental techniques which can detect the presence of many elements often simultaneously and often quantitatively providing rapid results on samples which in the past could take days The drawback is that the instruments tend to be expensive suited to particular sample types or matrices and complex in both setting up and in the interpretation of results Furthermore the general analytical chemist may have access and familiarity with only one or two methods Written by an international team of contributors each experts in their particular fields this book familiarizes analytical chemists with the range of elemental analysis techniques to enable them to specify the most appropriate test for any given sample In addition it contains important chapters on sample preparation and quality control essential elements in obtaining accurate and reliable analytical results As such this book will be essential reading for all analytical chemists The techniques of elemental analysis are important in many other disciplines so the book will be of particular interest to those commissioning a wide range of analytical measurements such as chemists geologists environmental scientists and biologists The breadth and depth of coverage will also make the book very useful for advanced students

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