METHOD FOR THE SPECTROGRAPHIC DETERMINATION OF THE TRACE ELEMENTS IN SOME MANGANESE-IRON ORES IN EGYPT AND ITS APPLICATIONS.

THESIS

Submitted for Degree of
Master
in Physics

by

Nabila Helmy El Sharkawy
B.Sc.

Supervising Comittee

Prof. Dr. Aida El-Bialy
Head of Physics Dept.
Faculty of Girls for Art, Science & Education
Ain Shams University

Late Prof. Dr. Moktar Rasmy Nashed
Prof. of Spectroscopy
National Research Center

1995

Ain Shams University
Faculty of Girls
for Art, Science & Education

Name of Student : Nabila Helmy El-Sharkawy

B.Sc.

Title of Thesis : *Method for the spectrographic determination of the trace elements in some manganese-iron ores in Egypt and its applications.*

Supervising Committe

Prof. Dr. Aida El-Bialy

Head of Physics Dept.

Faculty of Girls for Art, Science & Ed.

Ain Shams University

Late Prof. Dr. Moktar Rasmy Nashid

Prof. of Spectroscopy

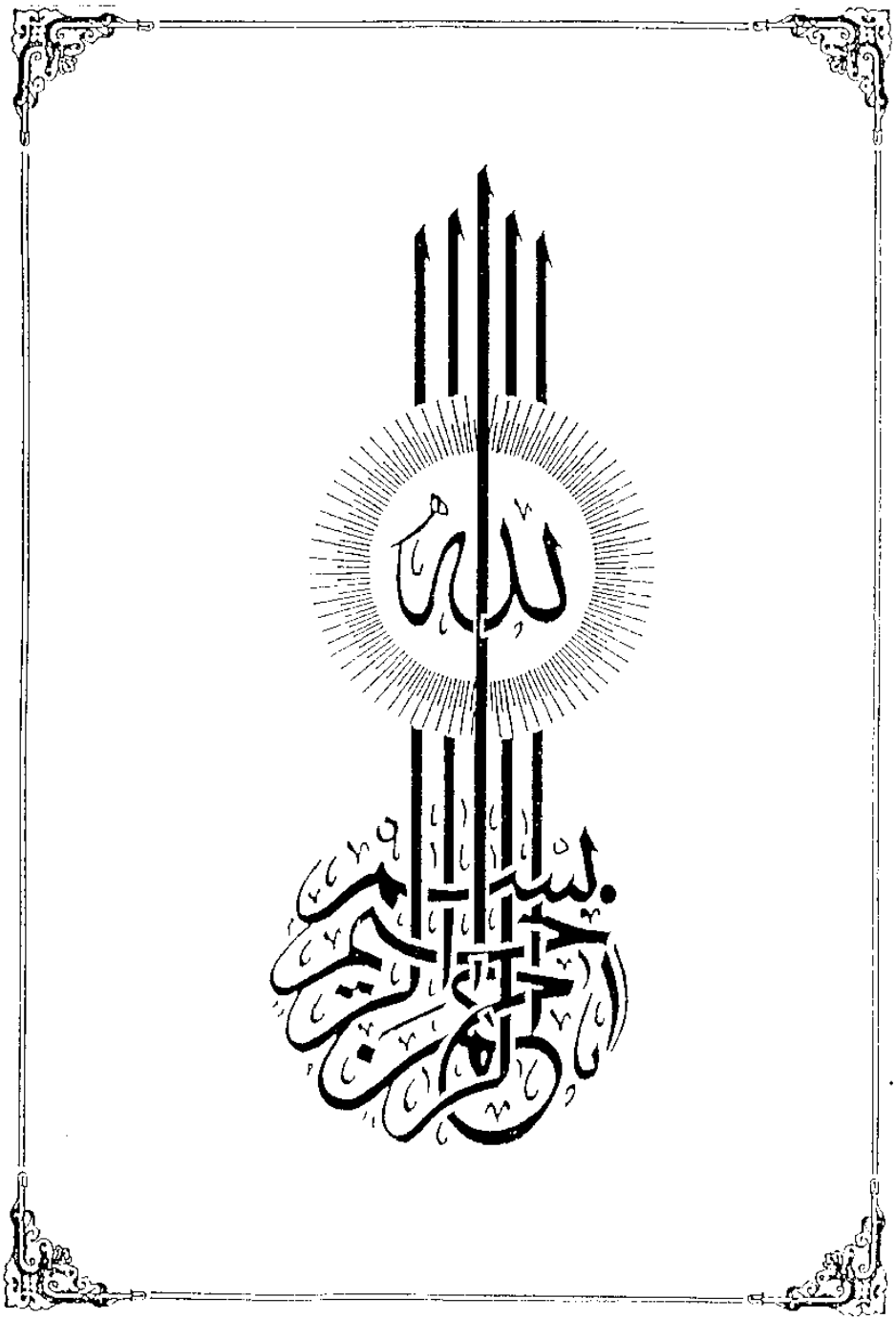
National Research Center

Approval Stamp:

Date of Approval : / / 199

Approval of Faculty Council

Approval of University Council



ACKNOWLDGEMENTS

I would like to express my gratitude to those who supervised my work :

1- Prof. D. Aida El- Bealy

Head of physics department, Faculty of Girls for Art, Science and Education, Ein Shams University.

2- Late Prof. Dr. Moktar Rasmy Nashid

Prof. of Spectroscopy

National Research Center.

I am also grateful to those who supported me in this research :

1- Prof. Dr. Anis B. Basily

Spectroscopy Section, National Research Center.

2- The auther wishes to thank her colleges who have helped her in quenching this work.

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

ABSTRACT

Development of qualitative and quantitative emission Spectrochemical Techniques for the determination of those elements in manganese dioxide ores using carriers. The two spectral lines method was used to measure both temperature and electron pressure using magnesuim as both thermometric and manometric element as applications.

SUMMARY

The present work deals with the determination of trace elements in Egyptian manganese ores by an emission spectrochemical method. The work includes 5 chapters.

Chapter I gives a survay of previous works which have dealt with the emission spectrographic analysis and works dealing with the interpretation of the results whatever the methods are.

A definition of term "manganese" ores and occurrance of manganese ores in Egypt was also given.

An idea of the uses of manganese ores in manufacture is reported. The aim of the work was briefly discussed.

Chapter II gives a derivation and a study of theoretical equations for the factors controlling the absolute intensity of spectral lines, the arc parameters and mathematical relations for working curves were recorded. These included the discussion of the following items :

a- Energy balance in the arc.

b- Thermal conductions in the arc.

c- Thermal equilibrium in the arc. This is described by five items as velocity distribution, ionisation, dissociation, radiations density and energy level population.

d- Local and partial thermal equilibrium in the arc.

e- Emission spectral lines and equations for their intensities.

f- Transition probability, statistical weight, partition function and excitation and de - excitation.

Theoretical and practical investigation of arc temperature and electron pressure and their measurements using magnesium as thermometric element were given.

h- Methods for emproving detection limits.

Chapter III includs the instrumentation and equipments used in this technique such as emission spectrograph.

generator, spectrographic projector, microphotometer photographic plates and developing techniques.

Chapter IV deals with developemnt of qualitative and quantitative techniques for the determination of trace element in manganese dioxide ores. This deals with the study of the effects of current, electron form and different buffers and carriers.

Investigate the form of electrode and its effect on both accelerated vaporisation of the samples and the arc temperature, and hence choice of the best form of electrode.

It was concluded that, chemically reactive carriers cause an increase in plasma temperature and in degree of ionisation of analysed elements together with an increase in both electron concentration and residence time of elements in plasma.

The time - density curves for volatilisation of elements with samples alone and samples mixed with carrier were investigated.

No satisfactory manganese line could be chosen as internal standard.

Preparation of synthetic standards and arcing the standards and samples were reported.

Construction of calibration and working curves. Determination of values of the trace elements in different samples, measurement of arc temperature and electron pressure experimentally were also shown.

As an application, magnesium lines were used to determine both arc temperature and electron pressure.

Chapter V gives the conclusions and discussions. For the determination arc excitation temperature, the two line method is used. The wave length (λ) , excitation potential (E_P) , statistical weight (g) and the transition probability (A) specifying the two magnesuim lines are used for the evaluation of excitation arc temperature.

In fact, introducing magnesium with such ionisation potential (7.64 eV) did not cause any effect on the ionisation of other elements.

Its volatility helped in the determination of temperature and electron pressuere.

Different ratios of MnO in MnO_2 were experimented. The most satisfactory ratio was 3 % Mg, as MgO in MnO_2 matrix. This sample was arced four times. Another similar sample containing 20 % CdI_2 ores also arced four times. A third mixture containing a similar sample together with 20 % CdF_2 was arced four times.

The excitation temperature measurements using the matrix alone was (5907 ± 169 K) , using CdI_2 20 % with matrix, the excitation temperature was (7554 ± 229 K) and for CdF_2 with matrix, the excitation temperature was (7276.9 ± 223 K).

Also the two spectral lines method was used to measure the electron pressure. The mean value of electron pressure using the matrix alone was 1233.3×10^{-4} atmosphere.

Using CdI_2 as a carrier for the same matrix, the mean value of the electron pressure was 2876.7×10^{-4} atmosphere, while using CdF_2 as a carrier for the same matrix, the mean value of the electron pressure was 2545.6×10^{-4} atmosphere.

finally, regarding the analysed arc samples, it is clear that Um Bogma samples show enrichment of Cu, Zn, Pb, Ni and the distribuation of trace elements in this area is irregular probably because of differences in minerologic constitution of the samples.

Wadi Mialik are samples that show enrichment in Ba. Increased amounts pf Pb, Cu, Ni, B and Zn were also observed in these samples.

Samples from Elba, manganese ores show a general enrichment in Ba, V, Zn and Pb and a relative enrichment in B.

One sample shows increased content of Sn and Co.