

**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

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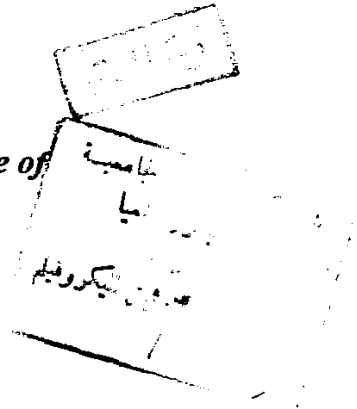
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ABSTRACT

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 magnesiuim 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 survey 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 occurrence 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 improving detection limits.

Chapter III includes 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 development 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 magnesium 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 pressure.

Different ratios of MnO in MnO₂ were experimented. The most satisfactory ratio was 3 % Mg, as MgO in MnO₂ matrix. This sample was arced four times. Another similar sample containing 20 % CdI₂ ores also arced four times. A third mixture containing a similar sample together with 20 % CdF₂ was arced four times.

The excitation temperature measurements using the matrix alone was (5907 ± 169 K), using CdI₂ 20 % with matrix, the excitation temperature was (7554 ± 229 K) and for CdF₂ 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 CdI₂ as a carrier for the same matrix, the mean value of the electron pressure was 2876.7×10^{-4} atmosphere, while using CdF₂ 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 distribution of trace elements in this area is irregular probably because of differences in mineralogic constitution of the samples.

Wadi Mialik are samples that show enrichment in Ba. Increased amounts of 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.

