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Editorial.....

It is heartening to note that our journal is able to sustain the enthusiasm and covering various facets of knowledge. It is our hope that IJMER would continue to live up to its fullest expectations savoring the thoughts of the intellectuals associated with its functioning .Our progress is steady and we are in a position now to receive evaluate and publish as many articles as we can. The response from the academicians and scholars is excellent and we are proud to acknowledge this stimulating aspect.

The writers with their rich research experience in the academic fields are contributing excellently and making IJMER march to progress as envisaged. The interdisciplinary topics bring in a spirit of immense participation enabling us to understand the relations in the growing competitive world. Our endeavour will be to keep IJMER as a perfect tool in making all its participants to work to unity with their thoughts and action.

The Editor thanks one and all for their input towards the growth of the **Knowledge Based Society**. All of us together are making continues efforts to make our predictions true in making IJMER, a Journal of Repute

Dr.K.Victor Babu
Editor-in-Chief

SOCIAL SCIENCES, HUMANITIES, COMMERCE & MANAGEMENT, ENGINEERING &
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IBERD
(International Board for Education, Research and Development)



International Board for Education, Research and Development (IBERD) is a budding organisation founded by a group of professors from University of Mumbai, with the objective of spreading knowledge and gaining insights to new technologies and pedagogy, thereby making a positive societal impact in India and the global community. IBERD emphasises on organisation of innovative academic activities for school children, innovative research programmes for college students and teachers etc.



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International Board for Education,
Research and Development
**1st International Conference on
Empirical and Theoretical Research**
ICETR-2019
Israel
May 29 - June 1, 2019

About Conference

This multidisciplinary conference aims to bring researchers from varied fields of knowledge on a common platform so as to provide an opportunity to all researchers to network and exchange their ideas in person. It offers the new horizons to the participants to find global partners for future research collaboration. The conference can also help the delegates to establish academic and non-academic international linkages with recognized Universities and higher educational institutes in Israel. The invited lectures by eminent speakers from international organizations and visits to industries, academic and research institutes are the key attraction of the conference.

First International Conference on Empirical and Theoretical Research (ICETR) was successfully held at Jerusalem, Israel from May 27 to June 3, 2019. Delegates from Higher Education, Jerusalem, University of Mumbai, Shivaji University, Kolhapur, Savitribai Phule University, Pune, Janmaitri Multiple Campus, Nepal attended the Conference. The research areas Languages and Social Sciences, Finance, Accountancy and Management, Life Sciences, Physical and Chemical Sciences, Health and Medicine, Engineering and Technology, Environmental Sciences were covered in the conference.

I and my team were happy to organize 1st International Conference on Empirical and Theoretical research (ICETR -2019) at Israel from 28th May - 1st June 2019.

Dr. Yaron Meir, Director, South East Asia, Department of Israel Ministry of Foreign Affairs, Israel and Dr. Uri Resnick of South East Asia, Department of Israel Ministry of Foreign Affairs, Israel inaugurated the conference. Prof. Eric Zimmerman, Director Research Support Office and Global Engagement IDC, Herziliya, Israel delivered keynote address to the gathering. Ms. Emma Afterman, Head of International Policy and Cooperation Strategy and International Affairs Department Council for Higher Education of Israel gave the brief introduction of HE system, the planning and budgeting system, growth in number of colleges and International research Collaboration.



Highlights of the Conference

- Opportunity to visit world's one of the most innovative and techno savvy countries.
- Interaction with world class personalities renowned in research and education.
- Gathering of Higher Education Commission, Universities and Institutions in Israel.
- Prospective for student and faculty exchange programme.
- Visit to working plants of technologies like Waste Management, Waste Water Treatment, Irrigation, etc.

Themes

- Languages and Social Sciences
- Finance, Accountancy and Management
- Life Sciences
- Physical and Chemical Sciences
- Health and Medicine
- Engineering and Technology
- Environmental Sciences

Special Thanks to

Hon'ble Ya'akov Finkelstein, Consul General, Consulate General of Israel, Mumbai

Hon'ble Nimrod Kalmar, Deputy Chief of Mission, Consulate General of Israel, Mumbai

Mr. Anay Joglekar, Political Affairs and Special Projects, Consulate General of Israel, Mumbai

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CONSULATE GENERAL OF ISRAEL
MUMBAI



הקונסוליה הכללית של ישראל
מומבאי (בומביי)

6 August 2019

TO WHOM IT MAY CONCERN

It is a great experience to be associated with the International Board for Education Research and Development (IBERD). We are happy to welcome them at Israel for the very First International Conference on Empirical and Theoretical Research (ICETR) 2019.

We are glad to learn that delegates with varied academic expertise in different areas of research visited Israel to interact with Israeli academicians and researchers as part of the conference. They visited reputed research and academic institutes of Israel to explore collaborative research and academic opportunities.

We, at the Consulate General of Israel were happy to facilitate the visit. We look forward to such continued intellectual exchanges and interactions in future!

On a personal note, I congratulate team IBERD for the success of ICETR - 2019 and wish you all the best for your future endeavours.

Regards,

Yaakov Finkelstein
Consul General, Israel





Jerusalem, August 5, 2019

**To: International Board
for Education Research and Development (IBERD)**

Dear Friends,

It is my pleasure to offer my greetings on the occasion of the publication in the *International Journal for Multidisciplinary Educational Research* of a collection of scientific papers that were presented during a conference held in Jerusalem between May 27th and June 3rd 2019 by the International Board for Education Research and Development (IBERD).

The broad thematic scope of these papers is emblematic of the wide range of disciplines and scientific excellence which were given expression during this conference. The opportunity to exchange views and generate exposure in Israel to ongoing scientific research in India provided an excellent basis for future collaboration.

I was privileged to be invited as a Chief Guest at the conference and was very glad to have had a chance to interact with the organizers and the many participating scholars.

On behalf of the Ministry of Foreign Affairs, I congratulate the organizers of this event and its participants. Scientific collaboration and exchange is a cornerstone of the ever-expanding bilateral relations between Israel and India. We look forward to a continuation of such cooperation and are committed to fostering expanded academic ties between academic institutions in both countries.

In sincere friendship

Dr. Uri Resnick
Asia-Pacific Directorate
Israel Ministry of Foreign Affairs

Message from Dr. Eric Zimmerman



Greetings to the participants of ICETR 2019 and to the readers of these pages. It was a high honor to address the many esteemed colleagues from India, in Jerusalem. The bilateral ties between India and Israel will continue to grow from strength to strength, in many sectors - including academia, through the good work of caring people such as yourselves. This will serve well the peoples of both countries. I do so look forward to working with you in building these sustainable bridges.

Yours most sincerely,

Prof. Eric Zimmerman

Director, Research Support Office and Global Engagement IDC

Herzliya, Israel

**Message from Ms. Emma Afterman
Manager Israel-Asia Academic Relations @ Council for Higher Education**

It was my pleasure to present at the International Conference on Empirical and Theoretical Research (ICETR 2019) organized by IBERD. In recent years academic cooperation between Israel and India has been growing, both in terms of joint research projects and student exchange, and we strongly encourage initiatives to foster greater understanding and collaboration between researchers and higher education institutions in Israel and India.



We believe there is much potential to work together in fields of common interest, including science and engineering, agriculture and environment, and social sciences and humanities. In both countries innovation and entrepreneurship plays a strong role in supporting economic growth, and there could be mutual benefit in working together in this field as well.

We believe the future is bright for Israel-India relations and we look forward to working together to further strengthen cooperation in the higher education field!

Message by Dr. Minakshi Gurav, President, IBERD

Greetings!

International Board for Education, Research and Development (IBERD) is a budding organization founded by a group of professors from University of Mumbai, with the objective of spreading knowledge and gaining insights to new technologies and pedagogy, thereby making a positive societal impact in India and the global community. IBERD emphasizes on organisation of innovative academic activities for school children, innovative research programmes for college students and teachers, etc.



IBERD has stepped forward with a small step of International Conference on Empirical and Theoretical Research (ICETER 2019) which was successfully organized at Jerusalem, Israel. We are happy to come up with a special issue of IJMER, publishing 18 research papers presented at this conference. We, the team of IBERD are happy have this issue with IJMER which is indexed in many reputed indexation services. This issue deals with research in different streams from social science to technology.

I and my team are sure that we will work together towards our goal and make this journey memorable!



Solvent Extraction Coupled with Spectrophotometry for Determination of Iron in Tablet, Ore and Alloy

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Abstract

Reagent Acetophenone 2', 4'- dihydroxy semicarbazone, is proposed as a sensitive spectrophotometric reagent for Fe(III). It is synthesized and characterized by NMR, IR and elemental analysis. A selective spectrophotometric method is presented for the trace determination of Fe(III) using A24DHS as spectrophotometric reagent ($\lambda_{\max} = 350 \text{ nm}$) in acidic aqueous solution ($\text{pH} = 3.4$). The Beer's law is obeyed in the concentration range from 1 to 5 ppm. The A24DHS forms a 1:2 violet coloured complex. The Sandell's Sensitivity is $0.01024 \mu\text{g cm}^{-2}$ with molar absorptivity $4048.0 \text{ L mol}^{-1} \text{ cm}^{-1}$. The proposed method has been successfully applied to the determination of Iron in tablet, ores & alloy.

Keywords: Iron, Spectrophotometry, n-Butyl alcohol, Acetophenone 2',4'-dihydroxy, semicarbazone derivative

1. Introduction

Iron and its compounds are widely used in alloys and various biological samples. Trace concentrations of Iron can also affect the physical and mechanical properties of metal and alloys. Iron is essential to nearly all known organisms. Therefore, precise knowledge of the Iron present in a various samples is required, for which an accurate assessment of the Iron is need of analytical methods for determination at ppm level. Methods such as atomic emission and mass spectrometry^{1, 2} which require sophisticated instruments. Some of the reagents used for the spectrophotometric determination of Iron are Bathophenanthroline³, Mercapto pyridine-1-oxide⁴, Pyridazine-3,6-diol⁵, etc. However, most of these methods suffer from certain limitation, such as interference by



number of ions^{6,7}, of low sensitivity⁸.

2. Experimental

The pH measurements were made using a pH meter Elico, Model LI-129, India in conjugation with a combined glass and calomel electrode. Shimadzu UV-Visible 2100 spectrophotometer with 1.0 cm matched quartz cells were used for all absorbance measurements.

3. Synthesis Of The Reagent

Acetophenone 2', 4' - dihydroxy semicarbazone(A24DHS)

Synthesis of ADHS involves two steps.

- Conversion of Resorcinol to 2',4'-Dihydroxy acetophenone⁵.
- Synthesis of semicarbazone derivative of 2',4'- dihydroxy acetophenone⁶.

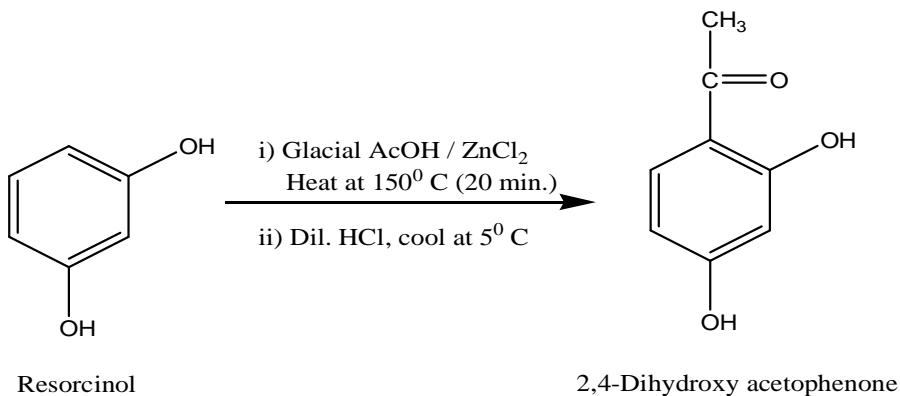
A) Conversion of Resorcinol to 2,4-Dihydroxy acetophenone

Freshly fused and powdered Zinc chloride (0.24 mole) is dissolved in glacial acetic acid (32 mL) by heating in a beaker on a sand bath. Dry Resorcinol (0.2 mole) is added with stirring to the mixture at 140°C. The solution is heated until it just begins to boil and kept for 20 min. At 150°C. Dilute Hydrochloric acid (1:1) is added to the mixture and solution cooled (50°C). The separate product is filtered and washed with dilute HCl (1:3). It is recrystallised from hot water containing little HCl. M.P. is 142°C (ref.7). Yield is 84.45 %. (Scheme 1)

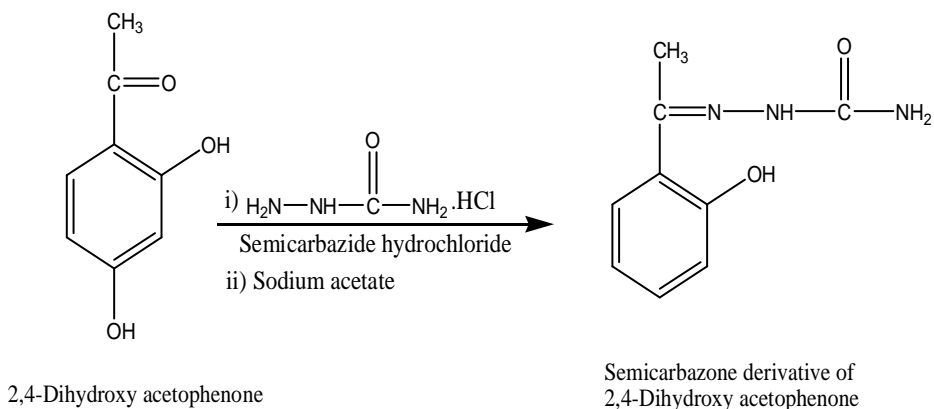
B) Synthesis of semicarbazone derivative of 2',5'- dihydroxy acetophenone

Equimolar mixture of sodium acetate and semicarbazide hydrochloride is dissolved in minimum quantity of water and then it is added to methanolic solution of 2',4'-Dihydroxy acetophenone. After addition warm the solution and stir the solution about one hour. The pink coloured compound is precipitate out, which is washed and then recrystallised by using 50% ethyl alcohol as solvent. (Scheme 2)

Scheme 1



Scheme 2





Physical characteristics and Spectral interpretation (Table 1, 2 & 3)

Table 1: The physical characteristics of A24DHS are shown in table.

| Compound | Color | Yield (%) | Molecular Formula | M. P (°C) | Mol Weight |
|----------|------------|-----------|--------------------------------------------------------------|-----------|------------|
| A24DHS | Light Pink | 75.25 | C ₉ H ₁₁ N ₃ O ₃ | 222-224 | 209.202 |

Table 2: IR - Spectral data of A24DHS (Elico Infra-Red Spectrophotometer)

| Frequency (cm ⁻¹) | Functional group | Frequency (cm ⁻¹) | Functional group |
|-------------------------------|---------------------------------------|-------------------------------|---------------------------------------------------------------|
| 3483 | v _(O-H) stretching | 1284 | C-N stretching |
| 3095 | v _(CH) aromatic stretching | 1375, 1173, 1155, 1116 | In plane bonds due to aromatic substituted benzene ring |
| 1593 | v _(C=N) stretching | 854 | Substituted benzene ring |
| 1520 | v _(C=C) stretching | 758 | v _(C-H) stretching due to substituted benzene ring |
| 1680 | v _(C=S) stretching | 538 | Benzene ring deformation |
| 1458 | C-O-H bending | 1375 | (CH ₃ -C) bending |
| 1323 | Ph-C-O stretching | | |



Table 3: H¹- NMR Spectral data of A24DHS (Bruker NMR spectrophotometer)

The chemical shifts were reported in δ relative to TMS used as an internal standard for NMR.

| Solvent | No. of protons | δ in ppm | Assignment |
|--------------------|--------------------|-----------------|----------------------|
| ^d -DMSO | s, 3H | 3.39 | CH ₃ -C=N |
| | s, 2H | 2.14 | -NH ₂ |
| | s, 1H | 2.48 | -NH- |
| | two d, 2H s, 1H | 6.1 to 7.3 | Aromatic Proton |
| | d, 2H | 12.98 | -OH |

Conclusion from spectra : The spectral interpretation confirms the structure of A24DHS.

4. Procedure For The Extraction:

1 mL of aqueous Iron metal solution containing 5 μ g of Iron was added to 2 mL of reagent in 10 mL standard volumetric flask. The pH of the solution adjusted to 3.4 and final solution diluted to 10 mL. The solution was then transferred to 100 mL separating funnel. 10mL n-Butyl alcohol was transferred to the same funnel. The funnel were shaken for two minutes and allowed to stand. Separated organic phase was passed through anhydrous Na₂SO₄ in order to absorb trace amount of water and then collected in 10 mL standard measuring flask diluted up to the mark with n-Butyl alcohol. The amount of Iron present in the organic phase determined quantitatively by spectrophotometric method at 350 nm and that in the aqueous phase was determined by thiocyanate method.

Fe (III) standard solutions

It was prepared by dissolving exact weighed amount of ammonium ferric sulphate in distilled water containing few drops of sulphuric acid.



Research & Development of Method:

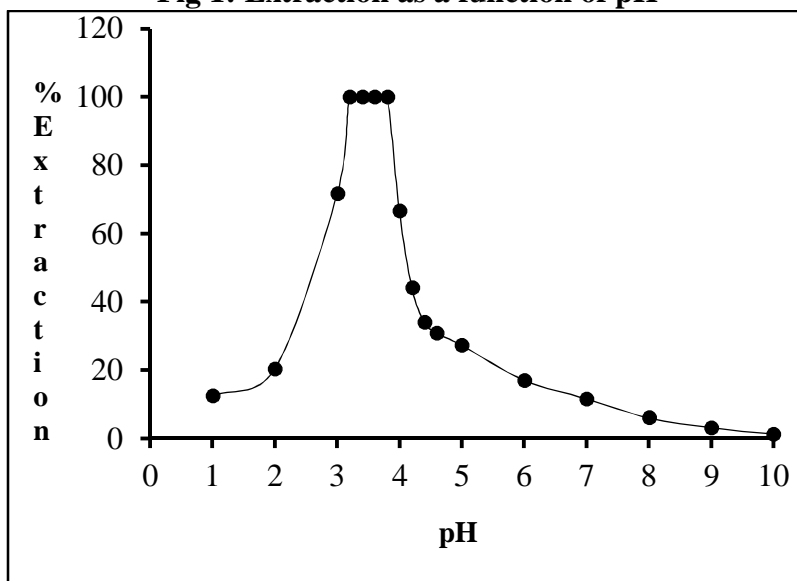
The results of various studies are discussed below.

5.1 Extraction as a Function of pH:

The extraction of Iron with Acetophenone 2',4'-dihydroxy semicarbazone has been studied over the pH range 1-10 and was observed that percentage extraction of Fe (III) is maximum at pH range 3.2-3.8. Hence, further extraction and determination carried out at pH 3.4.

(Figure 1)

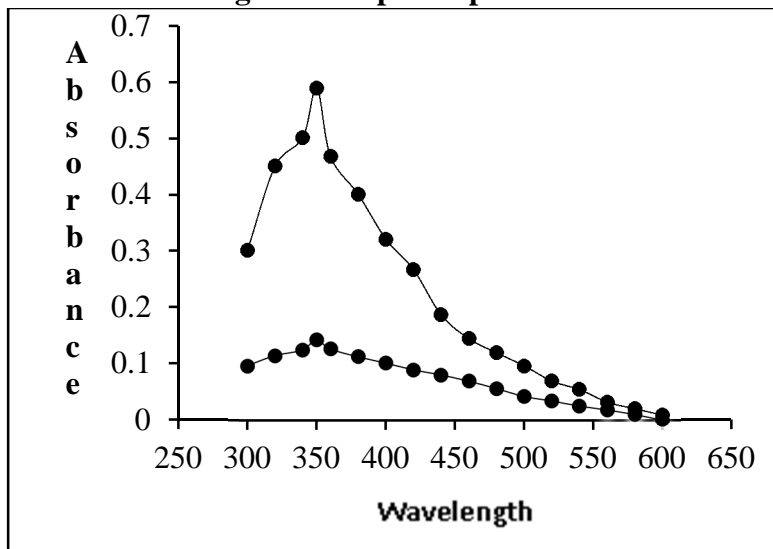
Fig 1: Extraction as a function of pH



5.2 Absorption spectrum:

The absorption spectrum of Fe (III): A24DHS in n-Butyl alcohol shows the maximum absorption at 350 nm. The absorption due to reagent at 350 nm is almost negligible. Hence all measurements were carried out at 350 nm. (Figure 2)

Fig 2: Absorption spectrum



5.3 Influence of diluents:

Extraction was carried out in various organic solvents and it was found that extraction of complex maximum in n-Butyl alcohol. Hence, n-Butyl alcohol was used for extraction of all other measurements.

5.4 Effect of reagent concentration:

It was found that 2 mL of 0.1% reagent is sufficient for the complex formation of the Iron in 10 mL of aqueous solution at pH 3.4

5.5 Calibration plot:

The Beer's law is obeyed in the range 1 to 5 ppm. The molar absorptivity is $3899.2 \text{ L mol}^{-1}\text{cm}^{-1}$ and sandell's sensitivity $0.0288 \mu\text{g cm}^{-2}$ respectively. (Figure 3)

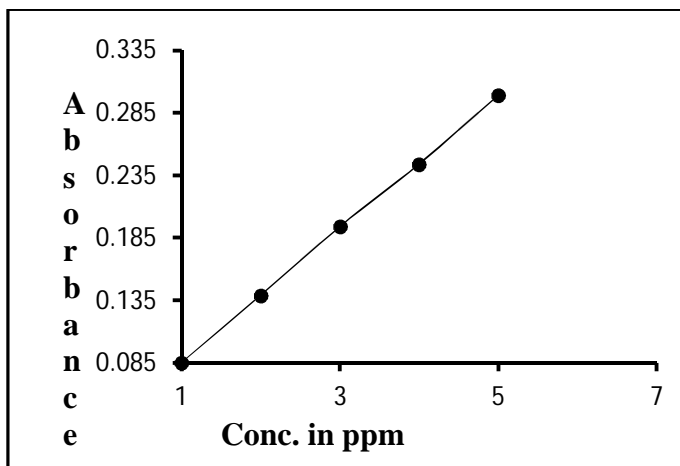


Fig 3: Calibration plot

5.6 Limit of Detection :

LOD¹⁰ (Limit of Detection) of the present method was calculate at 98.3 % confidence level, it was 0.102 µg/mL.

5.7 Effect of divalent ions and foreign ions

The interference of various ions present in various amount is studied and it was indicated no interference in the spectrophotometric determination Iron. The ions which show interference in Iron determination were overcome by using appropriate masking agents. (Table 4)

Table 4: Effect of divalent ions and foreign ions

| Sr. No. | Interfering Ion | Masking agent |
|---------|-----------------|---------------|
| 1 | V(V) | Thiourea |
| 2 | U (VI) | Oxine |
| 3 | Mo (VI) | Citrate |
| 4 | Cu (II) | Thiosulphate |
| 5 | Ti (IV) | Ascorbic acid |

5.8 Precision and accuracy:

The precision and accuracy of the developed spectrophotometric method have been studied by analyzing ten solutions each containing 3 μg of Iron in the aqueous phase. The average of ten determinations was 3.003 and variation from mean at 95% confidence limit was ± 0.00886 .

5.9 Nature of extracted species:

Job's continuous variation method, Slope ratio method and Mole ratio method has been used for determination of composition of complex. It shows that the composition of complex is 1:2. (Figure 4)

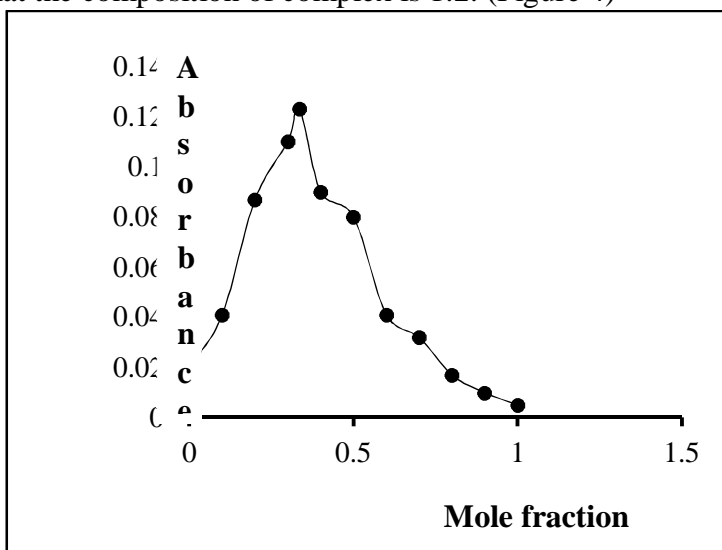


Fig 4: Nature of extracted species



5. Applications:

The proposed method was successfully applied for the determination of Iron from tablet, ores and alloys. (Table 7)

Table 5: Applications

| Sr. No. | Samples | Amount of Fe (III) | Amount of Fe (III) |
|---------|--------------------------------|---------------------|---------------------|
| | | Standard method | Present method |
| 1. | Alloy/ Ore (0.3 g) | | |
| a) | Hematite ore (53.06 % Fe) | 0.159 μg | 0.156 μg |
| b) | Elinver alloy (62.7 % Fe) | 0.188 μg | 0.186 μg |
| 2. | Pharmaceutical sample | | |
| | Supradyn (Multivitamin Tablet) | 11.17 mg | 11.18 mg |

6.1 Determination of Fe (III) in alloys/ore

About 0.3 to 0.5 g sample (alloy/ore) was dissolved in 15 cm³ of aqua-regia. The solution was evaporated to dryness and the residue was treated with concentrated HNO₃ and diluted to 100 cm³. An aliquot of a diluted solution was used for the extraction and spectrophotometric determination of Fe (III) by present method.

6.2 Tablet

To the Supradyn, Multivitamin tablet 1.0 cm³ of concentrated HNO₃ was added and evaporated to dryness. It was treated with 5.0 cm³ of 30 % H₂O₂ every time, till solution become colourless. The colourless solution was then treated with dilute HCl and evaporated to dryness. The residue was dissolved in 10 cm³ distilled water and aliquot of this was used for Fe (III) analysis by the present method.



6. Conclusion

The developed method is compared with the thiocyanate method for the estimation Iron. The results are comparable with both the methods. The method is simple and does not required any sophisticated instruments.

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