بسم الله الرحمن الرحيم

HOSSAM MAGHRABY

شبكة المعلومات الجامعية

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التوثيق الالكتروني والميكروفيلم

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جامعة عين شمس

التوثيق الإلكتروني والميكروفيلم

قسم

نقسم بالله العظيم أن المادة التي تم توثيقها وتسجيلها

علي هذه الأقراص المدمجة قد أعدت دون أية تغيرات

يجب أن

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بالرسالة صفحات

لم ترد بالأصل

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بسم الله الرحمن الرحيم

"ويرفع الله الذين أوتوا

العلم درجات"

صدق الله العظيم

"Treatment of industrial wastewater using electrocatalytic oxidation technique"

A Thesis submitted

To

Faculty of Science

Cairo University

By

Hossam Eldin Abdel Fattah Ahmed Hamed
(B.Sc.)

For

Partial Fulfillment of the Degree of Master of Science

2002

Approval sheet for submission

Title of M.Sc. thesis: *Treatment of industrial wastewater using electrocatalytic oxidation technique.*

Name of the candidate: ***Hossam Eldin Abdel Fattah Ahmed Hamed.***

This thesis has been approved for submission by the supervisor:

Prof. Dr. Amin Mahmoud Baraka

Signature: A. Baraka

Prof. Dr. Sadek E. Abdou

S. Abdou

Chairman of Chemistry Department

Faculty of Science- Cairo University.

جامعة القاهرة - كلية العلوم
إدارة الدراسات العليا و البحوث

ABSTRACT

Name : ***Hossam Eldin Abdel Fattah Ahmed Hamed***

Title of thesis : "***Treatment of industrial wastewater using electrocatalytic oxidation technique".***

Degree : (M. Sc.) unpublished Master of Science thesis, Faculty of Science, Cairo University, 2002

This work deals with the possibility of preparation of some modified electrodes which can be used as anodes for the electrocatalytic oxidation process of dyestuffs in their simulating solutions. The metals Pd, Pt, Rh, Au, and alloys Pd-Rh, Pt-Rh were electrodeposited on the previously anodized Ti substrates. The prepared electrodes are thermally activated at temperatures of 200, 350, 550 ^{o}C. These electrodes were characterized by SEM-Edax and X-ray diffraction techniques. Some electrodes were selected from those thermally activated at 350^{o}C for the use as anodes in the treatment process of dyestuffs. The dyestuffs included acid green dye, (basic dye), and methylene blue. The results of electrocatalytic oxidation process of the dyestuff solutions were expressed in terms of the remaining dye concentration and COD removal, which were determined instrumentally. The different operating conditions of treatment process were studied which include: current density, pH, temperature, time, type of conductive electrolyte and its concentration, and initial dye concentration. The optimum operating conditions for each dye and modified electrode were determined. The undertest modified electrodes gave good results for the complete removal of dye and COD. These optimum operating conditions were applied for the treatment of sulphur black dye in its true wastewater.

Key words: modified electrodes, titanium modified electrodes, electrodeposition, heavy metals, electrocatalysis, textile wastewater, wastewater treatment, electrooxidation .

Supervisor:

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NOTE

Besides the work done in the thesis, the candidate has attended and passed successfully the following postgraduate courses as partial fulfillment of the requirements of the degree of master of science:

1. Surface Chemistry
2. Electrochemistry of Molten Salts
3. Molecular Spectroscopy
4. Voltammetry
5. Nuclear chemistry
6. Mathematical Modelling
7. Advanced Analytical Chemistry
8. Molecular Structure determination
9. Quantum Chemistry
10. Electrokinetic Phenomena
11. Mechanism of Inorganic Reactions
12. Electrochemistry
13. Solar Energy Conversion
14. Catalysis
15. Thermal Analysis
16. Statistical Thermodynamics
17. Physical Metallurgy
18. X-ray Analysis
19. Physical Polymers
20. Group theory
21. Ionizing solvents
22. Mathematics
23. German language

Acknowledgement

No words can ever express my sincere gratitude for all the people who contributed to the fulfillment of this work.

I would like to express my hearty thanks for my supervisor: Prof. Dr. Amin M. Baraka, Professor of Physical Chemistry, Faculty of Science, Cairo University, for his fatherly guidance, valuable supervision, great effort in suggesting the points investigated, his personal interest in my work and discussion of the obtained results.. The guidance and support given by him were indispensable to the completion of this work.

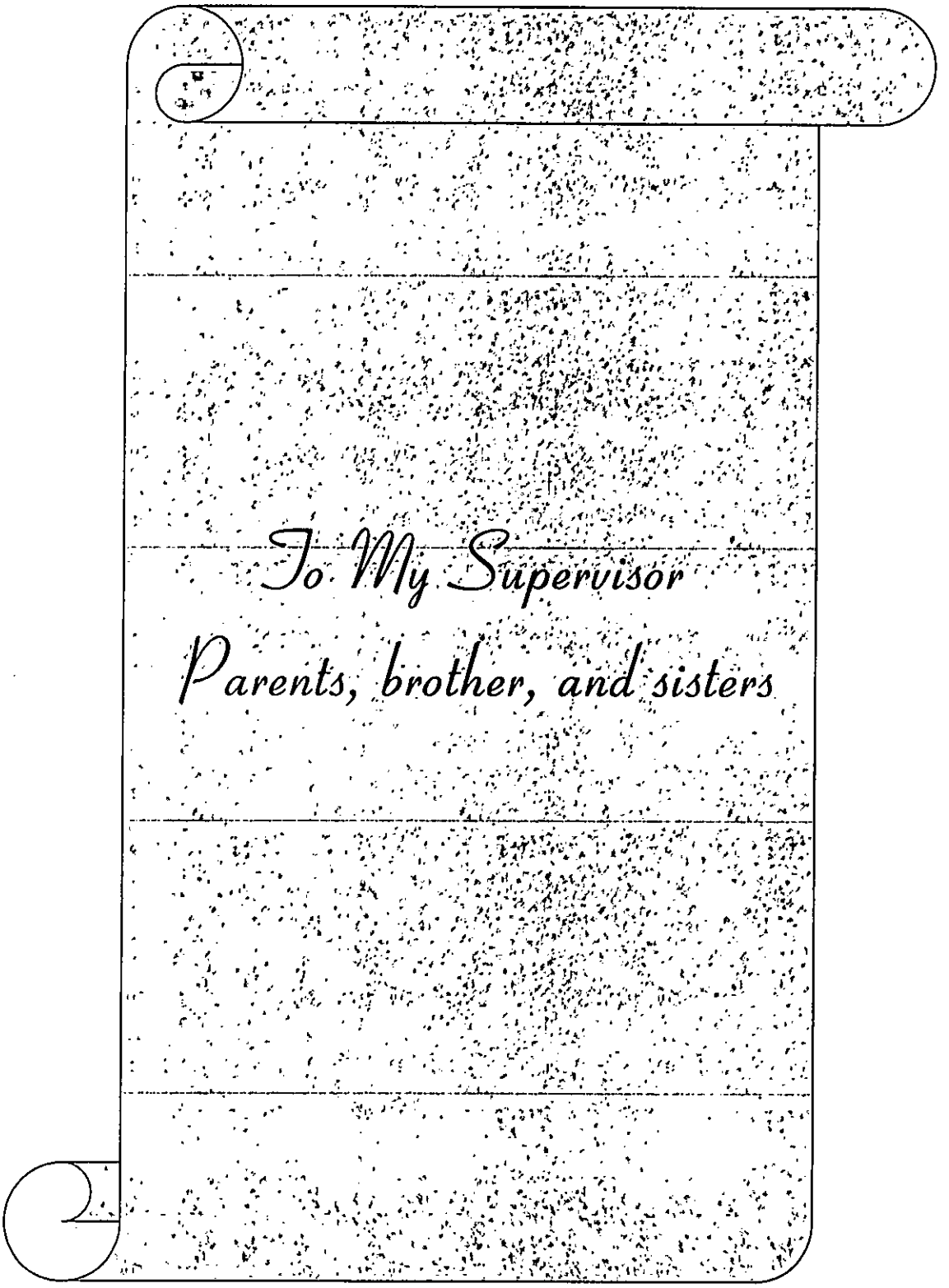
I wish to express my thanks to Dr.Hassan H.Sharawy researcher in the National Research Center- chemical engineering and pilot plant for his great efforts in suggesting the points investigated, helping and encouraging me in completing this work.

Many thanks to all of the staff members of the chemical engineering and pilot plant - National Research Center.

My indebtedness and gratitude are also to Prof Dr. Abdel Hamid. A. Hussein, Faculty of Engineering- Cairo Uneversity, for his helping and encouraging me.

Many thanks for Dr. Said A. Rahman and all of the stuff members of the Faculty of Science, Department of Chemistry , Cairo University for their valuable help.

Hossam E.Abdel Fattah


To My Supervisor
Parents, brother, and sisters

Contents

Aim and scope of the present work

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Textile industry represents one of the most important, strategic and the largest industries especially in Egypt. The investments in this field are very large and the number of workers and labor exceeds one million in Egypt. According to growing techniques in this industry, many problems had appeared concerning environmental and economic aspects.

One of the most important problems in the textile field is its wastes. The major pollution problems presented by textile industries are mainly the water pollution and waste effluents. Several millions of gallons of water with high pollution load resulted from effluents of textile industries could be easily estimated to be about 3 % of the total wastewater resulting from the different chemical industries. This huge quantity of water could be reused after treatment especially in countries suffering from water insufficiency.

Wastes in textile effluents may originate from naturally occurring pigments, diets, salts, oils and waxes found in cotton and wool raw materials .The other sources of pollutants are dyestuffs, auxiliaries and the different chemicals added during processing stages.

Dyestuffs in wastewater from textile effluents impart undesirable and objectionable taste, odor and color effects. Due to their high BOD* and COD** levels, they affect the surface water as well as aquatic plants and animals.

Unsaturated effluents from dyestuffs production and dyeing mills may be highly colored and, this is particularly objectionable if they are discharged in the open waters. The concentration may be much less than 1 ppm, but the dye is visible even at such small concentrations.

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* BOD Biological Oxygen Demand in mgL^{-1}.

** COD Chemical Oxygen Demand in $mgL^{-1}O_2$.