A THESIS ENTITLED

SYNTHESIS AND CHARACTERIZATION OF SOME NOVEL WHOLLY AROMATIC AZOPOLYAMIDE-HYDRAZIDES

Submitted by

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(B.Sc., Chemistry)

For

The Partial Fulfillment of
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(Organic Chemistry*)*

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Approval Sheet for Submission

Title of the M.Sc. Thesis: "Synthesis and characterization of some novel wholly aromatic azopolyamide-hydrazides"

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The work described in this thesis has been carried out under the supervision of ***Prof. Dr. Nadia Ahmed Mohamed Ahmed,*** Professor of Polymer Chemistry, Faculty of Science, Cairo University, and ***Prof. Dr. Mohammad Husain Sammour,*** Head of Projects and Planning Sector, Heliopolis Company for Chemical Industries.

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To whom it may concern

Besides the work carried out in this thesis, the candidate **Ali Mohamed Ali Ibrahem Elshafai** had studied the following post-graduate courses during the academic year 2006-2007 and passed their exams successfully.

- Heterocyclic Chemistry.
- Organic Spectroscopy.
- Advanced Physical Organic Chemistry.
- Natural Products.
- Biochemistry.
- Polymer Chemistry.
- Designing Organic Chemistry.
- Organic Photochemistry.
- Quantum Chemistry.
- Methods of Elucidation of Molecular Structure.
- Dyes.
- Elective Course (Green Chemistry).
- Carbohydrates Chemistry.
- Foreign language (German).

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Abstract

Name: Ali Mohamed Ali Ibrahem Elshafai

Title of the thesis: "Synthesis and characterization of some novel wholly aromatic azopolyamide-hydrazides"

Degree: M.Sc., Unpublished Master of Science Thesis, Department of Chemistry, Faculty of Science, Cairo University, 2010.

Twelve novel intrinsically colored wholly aromatic polyamide-hydrazides containing various proportions of para-phenylene and meta-phenylene units and azo linkages into their main chains were successfully synthesized by a low temperature solution polycondensation reaction of either 4-amino-3-hydroxybenzhydrazide (4A3HBH) or 3-amino-4-hydroxybenzhydrazide (3A4HBH) with an equimolar amount of either 4,4'-azodibenzoyl chloride (4,4'ADBC), 3,3'-azodibenzoyl chloride (3,3'ADBC), or mixtures of various molar ratios of 4,4'ADBC and 3,3'ADBC in anhydrous DMAc containing 3% (wt / v) LiCl as a solvent at -10 °C. The structures of the polymers were proven by elemental analyses, fourier transform infrared spectra, ultraviolet-visible spectra, ^{1}H and ^{13}C NMR spectra. Polymers properties were strongly affected by their structural variations. The solubility and the hydrophilic character of the polymers increased as a function of meta-oriented phenylene rings content incorporated into the polymer chains. On the other hand, the intrinsic viscosity, tensile strength, crystallinity, thermal and thermo-oxidative stability of the polymers increased as a function of para-phenylene units content in the polymer. The dye of the self-dyed prepared azopolymers showed a much better thermal, light and solvent migration properties than those exhibited by the monomeric dyes (4,4`ADBC and 3,3`ADBC). The dye migration properties of the azopolymers improved as a function of their para-phenylene units content. Further, the azopolymers showed a great affinity for complexation with various heavy metal salts. This affinity is not only dependant on the type and amount of metal salt used, but also on the polymer structural differences.

Key words: Polyamide-hydrazides; Azo linkages; Synthesis; Characterization, Dye migration properties; Metal complexation.

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Contents

List of Tables

List of Figures