بسم اللّه الرحمن الرحيم

شبكة المعلومات الجامعية
التوثيق الالكتروني والميكروفيلم

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

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لم ترد بالأصل

B ١٦٧٨٥

Zagazig University
Benha Branch
Faculty of Science
Physics Department

Preparation of Fluorescent ($PMMA/SiO_2$) Hybrids to Study the Photophysical Processes and Improve the Solar Energy Conversion Efficiency

THESIS

Submitted for the degree of
Doctor of philosophy (Solid State Physics)

BY

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(M.Sc. Experimental Physics)

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Dedicated to,

My Parents

المنار ٣٠٥

Contents

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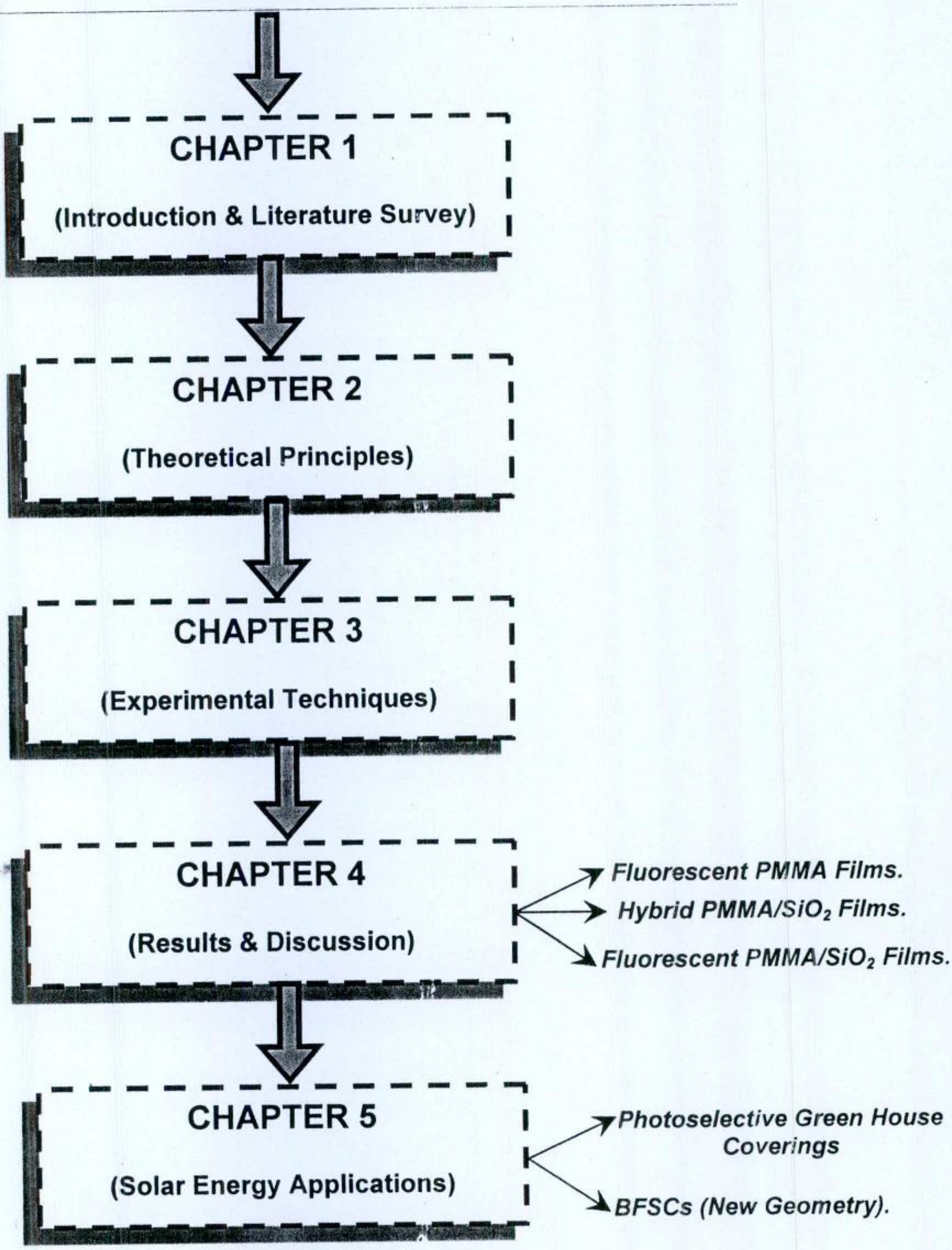
Samah M. El-Bashir

Abstract

The technical development of the fluorescent solar concentrators (FSCs) has been plagued by many problems in the past, including limited absorption of the solar spectrum; photodegradation of organic fluorescent dyes; fluorescence quenching at high dye concentrations due to the non-radiative energy transfer to dimers and the loss of about 25.78 % of the fluorescent photons out via the critical cones. This thesis proposed a number of concepts to overcome all the above limitations, including 1) the determination of the dimerization concentration of a coumarin derivative dye (MACROLEX Fluorescent Red G) in polymethylmethacrylate (PMMA) thick-films, 2) modification of PMMA matrix by its hybridization with hydrophilic nanosilica (SiO_2 nanoparticles) , and 3) overdoping hybrid matrix with very high dye concentrations which revealed a remarkable shift of the dye dimerization threshold from 100 ppm for PMMA to 200 ppm for PMMA/ SiO_2 matrix. All these information will finally be used to discuss and demonstrate the aspects of two promising implications regarding the application of FSCs in greenhouses and solar electricity conversion. Firstly, we will introduce a promising line of application of thick film FSCs as photoselective greenhouse coverings. It is well known that the plants utilize only the blue and red regions of solar spectrum but not the green and yellow. The green and yellow bands can be absorbed and converted to red fluorescence leading to the increase of the effective transmission of red light to more than 100%, promoting the growth of the plants in greenhouses. Secondly, a new "bended" design of planar FSCs is introduced. The maximum value of the optical efficiency η_{opt} was 45% which is higher than those published before due to the advantage of the new design in optimization the receiving of both direct and reflected solar energy income. The optimum apex angle was found to be 148.7 ^{o} which is well correlated to the location latitude.

Thesis Organization



Chapter 1

Introduction

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Literature Survey

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