شبكة المعلومات الجامعية

التوثيق الإلكتروني والميكروفيلم

# بسم الله الرحمن الرحيم


HANAA ALY

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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

تحفظ هذه الأقراص المدمجة بعيدا عن الغبار

HANAA ALY

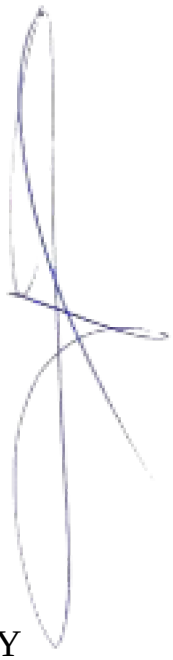
Cairo University

# MANUFACTURING OF BIODEGRADABLE PLASTIC FROM BIOMASS

By

**Nora Abd El-Waged Abd El-Gawad Moawad Zidan**

A Thesis Submitted to the
Faculty of Engineering at Cairo University
in Partial Fulfillment of the
Requirements for the Degree of
**MASTER OF SCIENCE**
**In**
**CHEMICAL ENGINEERING**



FACULTY OF ENGINEERING, CAIRO UNIVERSITY
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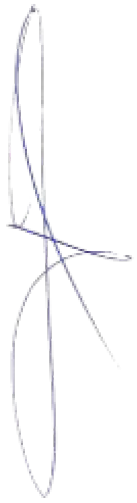

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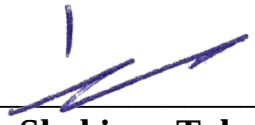

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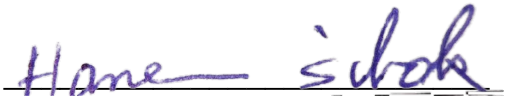

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**Title of Thesis:**

Manufacturing of Biodegradable Plastic from Biomass

**Key Words:**
Plastic Pollution; Biodegradable Plastics; Environment; Wastes; Potatoes Peels

**Summary:**

Plastic is a daily used material which cause serious environmental problems as their disposal methods are dangerous to both land and water. Plastics made of bio-based sources could be seen as a promising alternative to the conventional plastics as it tends to degrade safely and rapidly and hence helps in the safe environment management.

In this research, Potatoes peels together with acetic acid and glycerol were chosen as raw materials for the production of the biodegradable plastic. The objective of this research is finding the suitable raw material amounts and operating conditions which will give the nearest specifications to the conventional plastics.

Low reaction and drying temperatures were found to be the most suitable for physical appearance of the plastic. On the other hand, high acid amounts were recommended for rapid degradation and lower water absorption. Moreover, using high amounts of starch have enhanced the degradation properties and strength of the samples.

# Disclaimer

I hereby declare that this thesis is my own original work and that no part of it has been submitted for a degree qualification at any other university or institute.

I further declare that I have appropriately acknowledged all sources used and have cited them in the references section.

Name: Nora Abd El-Waged Zidan Date:../../2020

Signature:

# Acknowledgments

I have taken efforts in this research. However, it would not have been possible without the kind support and help of many individuals and organizations. I would like to extend my sincere thanks to all of them.

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My thanks and appreciations also go to my colleagues who gave me their effort and time.

Last but not least, I would like to thank every person who have willingly helped me out with his abilities and all people who have supported me and gave me the power to continue that research to the end.

**To all, I extend my sincere thanks.**

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# Nomenclature

A: Amylose
AP: Amylopectin
ASTM: American Society for Testing and Materials
BP: Banana Peels
BDB: Biodegradable Plastic
CBP: Conventional Biodegradable Plastic
CB: Commercial Bio based
DP: Degradable Plastic
FCI: Fixed Capital Investment
FTIR: Fourier Transform Infrared
HEPCA: Hurghada Environmental protection and conservation association
IPC: Indirect Plant Cost
MMUSD: Million Dollars
PBAT: Polybutylene Adipate Co-Terephthalate
PBSA: Aliphatic Polyester
PCE: Physical Cost of Equipment
PCL: Polycaprolactones
PEA: Polyester Amides
PET: Polyethylene Terephthalate
PHA: Polyhydroxyalkanoates
PLA: Polylactic Acid
PP: Potatoes peels
PPB: Potatoes Peel Biodegradable Plastic
PPC: Physical Plant Cost
PVA: Polyvinyl Alcohol
ROI: Return on Investment
RPP: Roasted Potatoes Peels
RS: Rice Starch
TCI: Total Capital Investment
TPS: Thermo Plastic Starch
WCI: Working Capital Investment