بسم الله الرحمن الرحيم

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تم رفع هذه الرسالة بواسطة / مني مغربي أحمد

بقسم التوثيق الإلكتروني بمركز الشبكات وتكنولوجيا المعلومات دون أدنى مسئولية عن محتوى هذه الرسالة.

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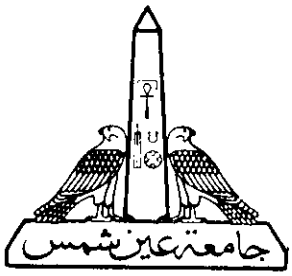


Textile/Polymer Composites of Some Protective Properties Prepared by Chemical and Radiation Treatments

Thesis Submitted for the requirements of philosophy Degree (Ph.D.) In Chemistry

By

Saleh Nagy El-sayed Saleh

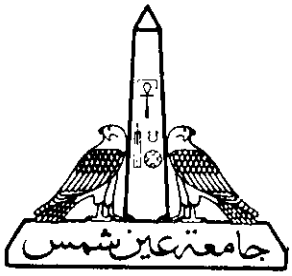
(M.Sc. in Chemistry 2015)

To

Chemistry Department, Faculty of Science,
Ain Shams University

Radiation Chemistry Department
National Center for Radiation Research and Technology
Atomic Energy Authority

2022



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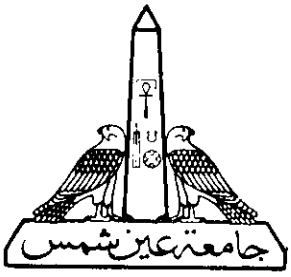

APPROVAL SHEET

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Acknowledgment

Deepest gratitude is owed to ***Prof. Dr. Abdel Gawad M. Rabie***, Professor of Organic Chemistry, Faculty of Science Ain-Shams University for sponsoring this thesis, his continuous interest, supervision and comprehensive advice and helpful discussion that made this work possible.

I would like to express my sincere appreciation to ***Prof. Dr. Abdel Wahab M. El-Naggar***, Professor of Radiation Chemistry, National Center for Radiation Research and Technology, Atomic Energy Authority for suggesting the topic of this work, continuous supervision, and practical support throughout this study and helpful discussion that made this work possible.

Deep thanks are also due to ***Prof. Dr. Mahmoud M. Salah El-Din***, Professor of Radiation Chemistry, National Center for Radiation Research and Technology, Atomic Energy Authority for his supervision, encouragement and guidance through this thesis.

Deep thanks are also due to ***Dr. Nisreen M. Ali*** for her supervision, encouragement and guidance through this thesis

Deep thanks are also due to ***Dr. Mervat M. Khaffaga*** *for* her supervision, encouragement through this thesis

Deep thanks are also due to ***Dr. Magdy A. Ali*** *for* his supervision, encouragement through this thesis

I would like to thank my colleagues in the ***Radiation Chemistry Department, National center for Radiation Research, and Technology, Atomic Energy Authority*** for their cooperation. Special acknowledgments go to my parents, brothers, relatives, and friends for their unconditional support.

Finally yet importantly, I am indebted for the unconditional support and encouragement provided by my family members and friends.

Aim of the Work

In the present work, copper/chitosan nanocomposites (Cu/CS) were prepared in an aqueous solution in the presence of CS as stabilizer and $CuSO_4 \cdot 5H_2O$ precursor. The Cu/CS NPs formation was proved through transmission electron microscopy (TEM), Dynamic light scattering (DLS), Fourier Transform infrared (FT-IR) spectroscopy and XRD diffraction. Cotton and cotton/polyester fabrics were gamma-radiation grafted by padding to pickup of 100%, in nanocomposites based on Cu/CS NPs loaded in polymer blends of poly(vinyl alcohol) (PVA) and plasticized starch (PLST). The grafted fabrics were characterized in terms of tensile mechanical, crease recovery and water absorption properties. The results showed that cotton fabrics displayed higher water absorption (%) than cotton/polyester fabrics for all PVA/PLST compositions and water absorption was found to decrease with increasing the ratio of PVA in the PVA/PLST blends. Cotton/polyester fabrics displays crease recovery angle (CRA) value of 147.6 upon treated with PVA/PLST (80/20%) and gamma irradiated to 30 kGy compared to CRA value of 125.0 for cotton fabrics treated under the same conditions. For cotton fabrics, the tensile strength was largely depends on the irradiation dose, in which the tensile strength of the treated fabric with the different formulations is higher than the untreated fabric. The antimicrobial activity of the fabrics against gram-positive bacteria (Staphylococcus aurous) and gram-negative bacteria (Escherichia coli) was investigated. In case of gram-positive bacteria cotton fabric showed the highest impact, for both 50/50 and 20/80 PVA/PLST of 14 and 14.5 mm inhibition zone, whilst, cotton/polyester fabric recorded 6 and 5 mm inhibition zone against gram-negative bacteria for 50/50 and 20/80 PVA/PLST, respectively.

The main objective of this work is to impart flame retardancy finishes to cotton and cotton/polyester fabrics by gamma-radiation grafting of composites based on poly(vinyl alcohol)/plasticized starch loaded with aluminum and phosphorus metals. The results indicated that the grafting of cotton or cotton/PET fabrics and loaded with aluminum and phosphorous metals enhanced water absorption (%), crease recovery and tensile mechanical properties. The flammability test in terms of time to catch fire (T_F), time after glowing (T_G) and weight left (W_L) showed that the grafted fabric displayed improved flammability than untreated fabrics. Grafted cotton fabric showed

higher stability against fire, versus the blend fabric for both Al ad Ph treatments. The Ph-treated fabric manifested high char formation on the surface of the fabric that suppressed the ignition of samples over that of Al-treated ones. Both Al ad Ph metal proved to satisfy the highest flame retardancy with minimum weight lose percent.

The main objective of this work is to impart UV protection properties to cotton, and cotton/polyester fabrics and enhancing the original chemical and physical properties. In this procedure, the fabrics were treated by coating with nanocomposites based on poly(vinyl alcohol)/plasticized starch (PVA/PLST) blends and Zn NPs. The coated fabrics were then exposed to gamma radiation to induce crosslinked hybrid structure. The formation of Zn NPs was confirmed by UV/vis absorption and XRD patterns measurements, whereas the treated fabrics were characterized by water absorption, crease recovery, thermal stability, surface morphology and tensile mechanical measurements. The results indicated that the treated fabrics showed highly reducing UV-A, UV-B and ultraviolet protection factor (UPF), particularly with increasing irradiation dose, regardless of fabric kind. It was found that cotton and cotton/PET fabrics coated with PVA/PLST/Zn NPs nanocomposites irradiated to a dose of 30 kGy displayed UPF excellent rating values of 44.31 and 58.23, respectively.

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