Optimization of Poly (vinyl chloride) Surface Modification with an Aromatic Schiff Base-Ni (II)) Complex as Photostabilizer

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Abstract. Though PVC is one of the most common synthetic polymers that differ from their analogues in low molecular weight alkyl halides in that they do not readily demonstrate the effects of simple nucleation. Chlorine removal is preferred in many condensation reaction situations, and the creation of the following double bond guarantees dark colored products. The chemical adaptation of poly (vinyl chloride) (PVC) with new functional thiol compound has been reported. A homogenous blend has been inserted to nickel chloride; the polymeric film were exposed to ultraviolet light for 300 hours. The structural changes in the modified film were observed by FTIR spectroscopy and losing in weight; the morphology of surface has been examined by optical microscope.

Keywords: PVC; modified, Films; 1,2,4-Triazole; nickel chloride; UV radiation; nucleophilic substitution

1. Introduction

Surface grafting is a procedure in which, without altering the characteristics of the bulk, only the surface is changed. In general, all fundamental chemically modifications of the bulk polymer and changes conducted solely at the surface stage, without altering the structure and characteristics of the bulk polymer, will demonstrate the impact contained on surface parameters. Polymerization of surface graft is being utilized to alter membrane surfaces utilizing different techniques of surface activation, involving irradiation by Ultraviolet light, [1,2], plasma remediation [3,4], ozone remediation [5,6], and chemical motivator [7,8] that could be gained through grafts polymerizations of living or free radical. Directly changes onto
the surface of polymer consequences to the porosity and pore sizes changes, which might be led to enhance the membrane of the polymer performance [9]. Graft copolymerization includes the interaction of freshly molecules of an initial formation copolymer or homopolymer [10] that are chemically attached to the polymer matrix, and may thus be utilized in traditional polymerization processes. Plasma-induced, photochemical, radiation and Chemical techniques and enzymatic grafting are among these techniques. [11]. In PVC alteration, polymerization of graft is often utilized to boost the efficiency of the polymer derivative and to leverage its application region. [9]. This project aims to establish relationships and understand interactions between UV radiation exposure and organo-modified polymeric chain of PVC by Schiff base-Ni(II) complex.

2 Experimental part
2.1 Preparing of modified PVC film
Schiff base as previously reported [12], and PVC in tetrahydrofuran have been blended and refluxed for 180 minutes. The prepared medium PVC has been poured into clean plate glass.

2.2 Preparing of PVC-ligand-Ni(II) film
In tetrahydrofuran, 300 x10⁻³ gm of synthetic improved polymer and 50 x10⁻³ gm of nickel chloride is dissolved. To formulate the complicated PVC-L-Ni(II) by evaporation method for a day, the reaction mixture was stirred for 180 minutes.

2.3 UV light exposure
In the QUV analyzer, transformed and Ni(II) complicated PVC layers have been subjected to Ultraviolet radiation (313nm as λmax, whereas the little intensity has been adjusted to 6.43 × 10⁻⁹ ein·dm⁻³/s) for 300h as UV irradiation period.

3. Consequences and Discussion
As recently stated [12], base of Schiff’s (Fig. 1) has been synthesized by a reaction of 3-(acetonitrile)-4-amino-5-mercapto-1,2,4-triazole and 4-nitrobenzaldehyde in boiled ethanol having acetic acid for four-six hour as a catalyst. The Schiff base structure has been verified by different spectral results that complied with those stated.

![Schiff base structure](image)

Fig. 1. Schiff base structure.

3.1 Monitoring the PVC films Photodegradation by FTIR Spectrophotometry
The peak intensities infrared (IR) for different function groups (for example, hydroxyl, polyene and carbonyl) for layers of PVC before irradiation were demonstrated in Figure 2.
Enhanced PVC thru the formation of heterocyclic and aromatic moieties by halogen displacement reaction, the PVC chlorine atoms displacement provides the convenience of ligands to PVC links.

Aliphatic ketones, covalently linked double bonding to the group carbonyl, and alcoholic hydroxy groups were related to bands occurring at 1722, 1602, and 3500 cm\(^{-1}\) in the FTIR range of PVC films[13]. For comparison [13], a standard peak that occurs at 1328/ cm, attributable to the C-C bond inside PVC chains, was used. UV irradiation did not cause such a peak. Fig. 3 shows IR reported after 300 hours of irradiation that reveals increases in absorption.

During UV exposure FTIR recorded the growth of absorbance as demonstrated in Fig. 4.
Fig. 4 FTIR spectrum of PVC-L-Ni(II) during UV radiation exposure.

The index of function group ($I_s$) for every function group has been determined utilizing the next Formula, where $A_s$ is the absorbance peak for a exact function group and $A_r$ is the absorbance for the reference peak:

$$I_s = \frac{A_s}{A_r}$$

PVC films blended with Ni(II) chelates suggests the increase of photostabilization as demonstrate in Fig. 5.

![Fig. 5 Carbonyl index after 300 h of irradiation.](image)

### 3.2 monitoring of PVC Photodegradation by Weight Loss

The PVC-L and PVC-L-Ni(II) films were irradiated for 300 h and the loss in weight (%) has been determined and drew upon irradiation duration as (Fig. 6). PVC loss percentage weight has lowest in PVC-L-Ni(II) films and highest for the blank PVC.
Fig. 6 Changes in the weight loss percent in PVC films during irradiation exposure.

4. Conclusion
PVC films blended with Ni(II) complex was utilized to increase the photostabilizers of PVC films. FT-IR spectroscopy and weight loss method indicated that PVC films blended with Ni(II) complex act as inhibitors of PVC photodegradation.

5. References

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