Khalid E Al Ani, J Nanomater Mol Nanotechnol 2018, Volume 9
DOI: 10.4172/2157-7439-C8-087

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Effects of UV-IR radiation and plasticization on stability of substituted polystyrene in solid films

In recent years, much attention has been focused on research to prepare new generation of Poly (para-substituted styrene) and to study the irradiation, thermal and plasticization effects on stability of these new polymers. The effect of irradiation of plasticized Para-substituted polystyrene in solid films was studied at different intervals of irradiation times and at difference percentages of added phthalates and terephthalates plasticizers. The degradation process was followed by UV-VIS, Fluorescence and FT-IR Spectroscopic techniques, to determine the type and amount of degradation that occur during irradiation. The irradiated pure and plasticized polymers solid films showed an increase in the intensity of absorption band by the increase in irradiation time and increase in the amount of added plasticizers. On the other hand the intensity of fluorescence was decreased upon the increase in irradiation time and increase in the amount of blended phthalate and terephthalate plasticizers. The analysis of the FT-IR spectra of the irradiated and non-irradiated samples, showed a noticeable formation of new bands and their intensity was found to increase with the increase in irradiation time and also with the increase in the amount of added plasticizer. In addition, the observed increase in the intensities of the carbonyl and hydroxyl absorption regions of the FT-IR spectra, providing evidence for the photo degradation as well as photo-oxidation of polymeric chains. Some kinetics work was applied to the results on fluorescence intensity of the excimeric emission to evaluate the quenching efficiencies and photo quenching rate constant by applying Al Ani-Hawi equation. Electrophilic substitution such as Cl and Br in the para position of the polymer backbone should be less stability towards UV-Irradiation, whereas, nucleophilic substitution such as (-H,-CH_3,-OCH_3,-OC_2H_5,-C_6H_5, α -CH_3, α -OCH_3, Phenyl and -C $(CH_3)_4$ should be higher stability towards irradiation of plasticization. Among the para-substituted polystyrene, Poly (4- fluoro styrene) should a very high stability towards irradiation and plasticization that all polymers used in these studies. It is even more stable than polystyrene. The mechanism of the photo degradation of these irradiated polymers was found to start from abstraction of α-hydrogen atom from the phenyl group followed by a random chain scission in the polymer backbone. A proposed mechanism for the photo degradation of para-substituted styrene in solid films and in solution was based on the decrease or increase in the functional groups that appears from the FT-IR spectra of irradiated solid films.

Biography

Khalid E Al Ani has completed his PhD from Southampton University, England and Postdoctoral studies from Texas University, USA. He was a Visiting Professor at Liverpool University at the Inorganic and Industrial Department, Liverpool, UK. He was a Professor at Baghdad University, Department of Physical Chemistry, Iraq. He was also a Professor of Physical Chemistry at Oran University of Science and Technology-Algeria, Hashemite University, Jordan. He was the Dean of Faculty of Pharmacy and currently the Head of the Pharmaceutical Sciences Department at Jadara University, Irbed, Jordan. He has published more than 48 original articles in international journals and attended many international conferences.

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