



INTERNATIONAL JOURNAL OF RESEARCH IN PHARMACEUTICAL SCIENCES

Published by Pharmascope Publications

Journal Home Page: www.pharmascope.org/ijrps

Synthesis and characterization poly (5-indanyl methacrylate-co-ethyl methacrylate)

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Article History:

Received on: 30.07.2018
Revised on: 14.10.2018
Accepted on: 17.10.2018

Keywords:

5-indanyl methacrylate,
Ethyl methacrylate,
Benzyls peroxide

ABSTRACT

The copolymer (5-IndanylMethacrylate-co-Ethylmethacrylate) is synthesised by the reaction of free radical Solution polymerisation at 70°C using Benzoyl Peroxide. The copolymer is characterised by NMR and IR Spectroscopy. The solubility of the polymers was tested in various polar and non-polar solvents. The Thermal Properties of the copolymer has been determined by means of Differential Scanning Calorimetry Analysis (DSC) and Thermogravimetric analysis (TGA). Thus, the thermal stability of copolymer increases with a decrease of Ethylmethacrylate content in the copolymer.



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ISSN: 0975-7538

DOI: <https://doi.org/10.26452/ijrps.v10i1.1772>

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INTRODUCTION

The Methacrylates Polymers and its derivatives are very important materials, and they have wide application to prepare the materials with highly improved properties. The advantage of methacrylate polymers and copolymers are highly thermal stability and mechanical stability. The copolymer of activated methacrylates has been used to synthesis the electroactive polymers, Macromolecular drug carries and Polymeric reagents for peptide synthesis. Aromatic acrylates and methacrylates are highly reactive monomers because of the aromatic ring, and they form an interesting class of polymers. The advantage of copolymers especially designed with functional active groups as a lateral substituent of the main chain is a topic of increasing activity and interest in polymer science.

Copolymerization is the most successful method adopted for the preparation of materials with tailor-made properties (Vijayaraghavan *et al.*, 1996; Soykan *et al.*, 2000; Vijayanand *et al.*, 2002; Balasubramanian *et al.*, 1996; Pitchumani *et al.*, 1982; Bankova *et al.*, 1983). The introduction of ester or amide linkages in the polymer backbone renders the resulting the aim of our research to study the synthesised and characterisation of Copolymer of poly (5-Indanyl Methacrylate (5-IMA)-co-Ethylmethacrylate). The Copolymer was characterised by Fourier transform infrared (FT-IR), Nuclear Magnetic Resonance Spectroscopic Techniques (¹H-NMR) spectroscopy. (Senthilnathan *et al.*, 2016) Analysis of the thermal properties of the Poly (5-Indanyl Methacrylate –co- EthylMethacrylate) by Thermogravimetric analysis (TGA) and Differential Scanning Calorimetry Analysis (DSC) are also reported.

MATERIALS AND METHODS

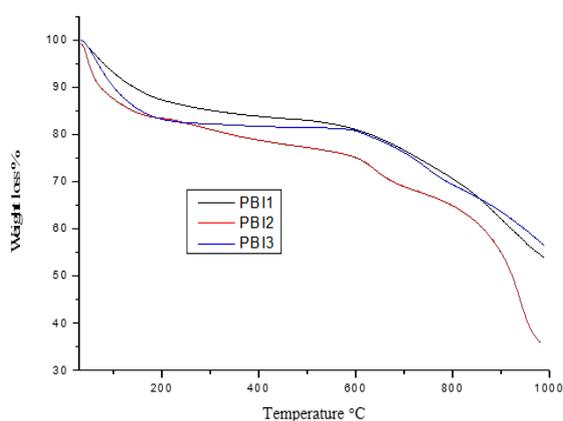
Ethyl methacrylate (Aldrich), 5-indanol (Aldrich) was used as received. Benzoyl peroxide was recrystallised from methanol at 0-10°C. Benzene and diethyl ether (AR) and Methanol of LR grades were used without further treatment. Methacryloyl chloride was prepared by distilling a mixture of acrylic acid and benzoyl chloride. (Senthilnathan *et al.*, 2016)

Table 1: Thermal stability of developed Copolymers

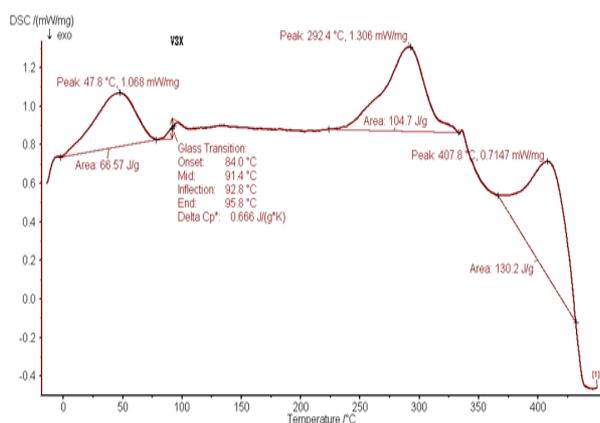
Polymer	Stable up to temperature (°C)
5-IMA: EMA (20:80) PBI 1	160
5-IMA: EMA (50:50) PBI 2	194
5-IMA: EMA (80:20) PBI 3	242

Table 2:

Solvent	Solubility
Dimethyl Sulfoxide	Partially soluble
Chloroform	Completely soluble
Acetone	Completely soluble
Toluene	Completely soluble
Benzene	Completely soluble

**Figure 4: Differential scanning calorimetry analysis (DSC)**

The DSC Spectrum of poly 5-IMA-CO-EMA is shown figure 6. DSC a standard tool for measuring the melting and freezing points of polymers. The 'Tg' value for copoly (5-IMA-Co-EMA) is 84°C. Actually, by the incorporation of 5-IMA unit in the copolymer, there is a visible increase in the 'Tg' value.

**Figure 5: DSC of poly (5-IMA-co-EMA)**

Solubility test

The solubility of copolymers is carried out by various solvents of different polarity. The polymers were easily soluble in various solvents, namely toluene, benzene, chloroform and acetone.

CONCLUSION

The copolymers of (5-Indanyl Methacrylate-Co-EthylMethacrylate) having different compositions were synthesised by free radical solution polymerisation mechanism. The Characterizations of the copolymer were performed by FT-IR, ¹H-NMR, spectroscopic techniques. The copolymers are soluble in acetone, toluene and benzene. The thermal stability of the Copolymers increases with the decrease of EMA content in the copolymer. The glass transition temperature of the copolymer increases with EMA content.

Acknowledgement

The authors are thankful to Head of the Department, Department of Chemistry, B.S. Abdur Rahman University, for providing the necessary facilities for the research works.

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