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NOTE

Synthesis of Tercopolymer Derived from Maleic Anhydride, Vinyl Acetate and Acrylamide

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The tercopolymer of maleic anhydride, vinyl acetate and acrylamide was prepared under different temperature conditions using metal complex as initiator. The tercopolymer, thus formed was characterized by FTIR and its thermal degradation by TGA. It will be worth finding to ensure the optimum temperature at which the tercopolymer synthesized reports maximum yield.

Key Words: Synthesis, Tercopolymer.

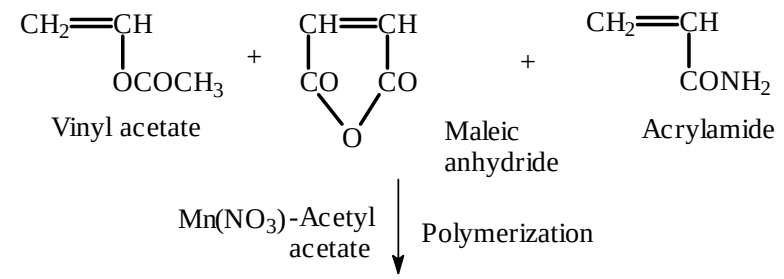
Tercopolymer of vinyl chloride, vinyl acetate and maleic anhydride was reported to show the equation utility and the types of information that might be obtained from them[1,2] and in particular, demonstrated by most of the modified tercopolymer[3-5]. The radical tercopolymerization of maleic anhydride with styrene and vinyl acetate was 0.5 order in catalyst and 1-3 order in monomer and had overal activation energy 21.6 Kcal/mol. Kinetic equations for the co-polymerization were derived by reported methods[6,7].

In the present work we describe in detail the results of the infrared spectral investigation on the tercopolymer and thermogravimetry analysis to ensure the mechanism of degradation.

All the substrates under experiment were of analytical grade and were purified before use. Solvents were dried and distilled and monomers were purified as given elsewhere. Infrared spectral studies were performed on shimadzu 8201 PC in KBr phase and the thermogravimetry analysis (TGA) by Perkin-Elmer USA model.

Vinyl acetate (9 mL), maleic anhydride (300 mg), acrylamide (300 mg) and initiator (50 mg) were taken in a small beaker and were thoroughly dissolved. The initiator manganese complex of acetyl acetonate was synthesized by reported method[8]. Each glass ampule was filled with 3 mL of this solution. The samples were sealed and put to heating on water bath at 75ºC. After 15 min of operation, the solution of the mixture turn light pink colour then after 15 min it became remarkably pink. It was heated

for 3 h more. The ampules were cooled and broken. The tercopolymer was collected in a petri dish. The undesired homopolymers was removed by extraction with soxhlet apparatus using benzene till constant weight. The viscous tercopolymer dried in oven at 60ºC to solid form. The yield of tercopolymer was 6.8 g.



n{Tercopolymer of VA - MA - AL]

The solubility of tercopolymer in different solvents was carefully recorded as follows:

S.No.	Solvent	Solubility	Remark
1.	Acetone	Slightly soluble	—
2.	Ethyl acetate	Insoluble	—
3.	Benzene	Insoluble	—
4.	Carbon tetra chloride	Insoluble	—
5.	Chloroform	Insoluble	—
6.	Sodium hydroxide	Insoluble	Swells
7.	Sulphuric acid	Insoluble	Colour blackens

The infrared spectra of tercopolymer had many peaks and a few humps. An absorption peak at 772 cm^{-1} was indicative of out-of-plane bending of N–H. A small peak at 1028 cm^{-1} was observed (C–O) band of ester of primary alcohol, occured in 1064-1031 cm^{-1} region. The peak at 1256 cm^{-1} was indicative to >C=O stertching of ester, near of 1358 cm^{-1} for CH_2 frequency. An absorption band at 2831 cm^{-1} can be associated to N–H stretching and C–H stretching in the range of 3600-2500 cm^{-1}. A biggest absorption band can be assigned at 3427 cm^{-1}, indicative of free N–H stretching vibration, observed in dilute solutions near 3500-3400 cm^{-1}.

Thermo gravimetry analysis for tercopolymer of MA-VA-AL: The TGA of tercopolymer revealed that the compound started to decompose at 100ºC with 3.37 % loss in weight. Loss in weight gradualy increased and at temperature 450ºC, 73.86 % loss in weight was noted. Decomposition was completed around 480ºC.

S.No.	Temperature (ºC)	Weight Residue (mg)	% Weight Loss (mg)
1.	100	96.62	3.37
2.	150	89.20	10.79
3.	200	70.99	29.00
4.	250	60.87	39.12
5.	300	53.456	46.55
6.	350	44.688	55.31
7.	400	34.688	65.43
8.	450	26.138	73.86

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