

**NOTE****Synthesis of Copolymer of Maleic Anhydride and Vinyl Acetate Using Antimony Oxide as Catalyst**

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The copolymer of maleic anhydride and vinyl acetate was synthesized under different reaction conditions using antimony oxide as catalyst.

**Key Words:** Synthesis, Copolymer, Maleic anhydride.

Ushakov *et al.*<sup>1</sup> synthesized the copolymer with vinyl acetate and maleic anhydride and proposed a random copolymer structure for them. The formation of copolymer and the rate of copolymerization of vinyl acetate was measured by dilatometry<sup>2</sup>. This copolymer was also prepared by polymerizing maleic anhydride and vinyl acetate in H<sub>2</sub>O, immiscible solvent with radical producing catalysts and then adding H<sub>2</sub>O to the mixture to hydrolyze the copolymer<sup>3</sup>. The MAn-VAc copolymers prepared at temperatures below 90°C have alternating structure<sup>4-8</sup>. In the present work, the poly(MAn-co-VAc) was prepared in presence of 2,2'-azo-bis-isobutyronitrile (AIBN) using antimony oxide (Sb<sub>2</sub>O<sub>3</sub>) as catalyst.

The molecular weight was determined on Model Series-200 and of make Perkin Elmer USA of GPC instruments. Pure distilled vinyl acetate (27 mL) (purified by two fold vacuum rectification), maleic anhydride (900 mg), 2,2'-azo-bis-isobutyronitrile (90 mg) (purified by three fold recrystallization from ethanol) and 36 mg of catalyst antimony oxide were taken in a beaker. The monomers were mixed well to a solution form and ampules were filled putting 3 mL in each of this solution. The ampules were sealed and put to heating on water-bath at 80°C. After 0.5 h, the solution in ampule seemed to light white and soon remarkable white. The reaction was stopped after 3 h, the ampules were cooled and broken, then the copolymer was collected in a petri dish.

The homocopolymer (PVAC) was removed by extraction with soxhlet-apparatus using benzene as an eluent till constant weight. the resultant appeared in viscous condition and after drying in oven at 60°C the mixture was in solid form (yield *ca.* 14.4 g).

The molecular weight of copolymer of MAn-VAc with  $\text{Sb}_2\text{O}_3$  catalyst was calculated 94819. The weight average of the molecular weight and polydispersity were found to be 282066 and 2.975, respectively. The solubility was carefully performed with various solvents.

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

The infrared spectrophotometric measurements of copolymer showed bond formation processes occurring in the copolymer sample. The peak which is seen at  $1358\text{ cm}^{-1}$  indicative of  $-\text{CH}_2$  frequency. The sharp peak at  $1596\text{ cm}^{-1}$  may be due to  $(\text{C}=\text{C})$  stretching. There are terminal  $>\text{C}=\text{O}$  moieties too. If we assume the formation of low molecular weight poly (MAn-co-VAc) or a certain tendency of catalyst  $\text{Sb}_2\text{O}_3$  to form a complex in which it bind with ligand. Such a way that  $>\text{C}=\text{C}<$  remains intact. There is a peak at  $3425\text{ cm}^{-1}$  due to ovetone of  $>\text{C}=\text{O}$  stretching or the  $-\text{OH}$ .

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#### REFERENCES

1. S.N. Ushakov, S.P. Mitsengendler and V.A. Chekhovskaya, *Zhur. Priklad. Khim.*, **24**, 485 (1951); S.N. Ushakov, S.P. Mitsengendler and V.A. Chekhovskaya, *J. Gen. Chem.*, **21**, 529 (1951).
2. M. Matsumoto and M. Maeda, *Chem. High Polym.*, **12**, 428 (1955).
3. M.L. Rue, G.W. Mizuno, B.S. Crecelius and T.E. Brunelle, *Ger. Offen.*, p. 2, 301, 507 (1971).
4. C. Caze and C. Loucheux, *J. Macromol Sci. Chem.*, **A9**, 29 (1975).
5. A. Shimizu, K. Hayashi and S. Okamura, *Nippon Hobunshi Nempo*, **5**, 129 (1964); A. Shimizu, K. Hayashi and S. Okamura, *Chem. Abstr.*, **63**, 18290a (1965).
6. Kuraray Co., Japanese Patent, 91,995 (1978).
7. M. Brissova, J. Augustin and M. Simmonetti, *Int. J. Biol. Macromol.*, **16**, 131 (1994).
8. M. Brissova, J. Augustin and E. Staudner, *Macromol. Rapid Commun.*, **15**, 211 (1994).