STUDIES ON GRAFT COPOLYMERISATION OF VINYL MONOMERS ONTO NYLON 6 FIBRE BY PHOTO - IRRADIATION

By

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CERTIFICATE

This is to certify that the thesis entitled "STUDIES ON GRAFT COPOLYMERISATION OF VINYL MONOMERS ONTO NYLON 6 FIBRE BY PHOTO-IRRADIATION" being submitted by Mr. H.R. Goel to the Indian Institute of Technology, Delhi, for the award of the degree of Doctor of Philosophy in Textile Technology, is a record of original work carried out by him under my supervision. The thesis, to my knowledge, has reached the requisite standard.

The results contained in this thesis have not been submitted, in part or full, to any other University or Institute for the award of any other degree.

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ABSTRACT

Graft copolymerisation of three vinyl monomers viz., methylmethacrylate (MMA), ethyl methacrylate (EMA) and n-butyl methacrylate (n-BMA) were carried out onto nylon 6 fibre in water and water-alcohols (three different alcohols, methanol, ethanol and n-propanol) mixture (ratio 1:1) as medium by photo-irradiation technique at 70°C in the presence and absence of fructose which was found to act as an energy transfer agent. Graft add-on % (GAO %) and grafting efficiency (GE) usually increase with the increase in the monomer concentration and time period of grafting. With increase in fructose concentration there is an initial increase in grafting followed by a decrease. In general, it was observed that an increase in the alkyl chain length of a monomer leads to a decrease in grafting. Similarly, with increase in the alkyl chain length of the alcohols used as media the grafting decreases.

I.R., TGA and SEM studies confirm the contention that grafting does take place by the method employed. With the increase in the graft level the % crystallinity and orientation are affected adversly. The diameter of the grafted samples increased due to the incorporation of the graft chain. The non-polar monomers used imparted a decreased solubility characteristics in polar solvents.

The moisture regain values also, for this reason, decreased. The melting points of the modified samples have been lower than those of parent nylon 6. The incorporation of long alkyl chains in the nylon 6 structure leads to an increase in the flammability characteristics. The overall thermal stability and the IDT values also decrease continuously with increase in graft level. Higher is the alkyl chain length in the monomer the lower is the thermal stability of the grafted samples. The glass transition temperature (T_g) and melting temperature (T_m), as evaluated by differential thermal analysis (DTA) show an overall decrease in these values. The initial modulus and tenacity values decrease and % elongation increase with the increase in the graft level of the modified nylon 6 fibre. This happens due to branching (grafts) and the essential amorphous characteristics of the grafted chains. The disperse dye uptake values decrease with increase in the graft level due to filling of the amorphous zones by the grafted chains and also due to the decrease in proportion of nylon 6 in the modified fibre.

CONTENTS

			Page No.
	ABSTRACT		
PART I	GENERAL INTRODUCTION		
CHAPTER 1	INTRODUCTION AND REVIEW OF LITERATURE		
	1.1	Introduction	1
	1.2	Graft Copolymerisation	2
	1.3	Methods of Graft Copolymerisation	3
		1.3.1 Grafting by Chemical Initiation	3
		1.3.2 Grafting by Irradiation Initiation	12
PART II	EXPERIMENTAL		
CHAPTER 2	EXPERIMENTAL TECHNIQUES FOR GRAFT COPOLYMERISATION, CHARACTERISATION OF THE GRAFTS AND EVALUATION OF THEIR PROPERTIES		
	2.1	Materials used	24
	2.2	Photo-irradiation Source	24
	2.3	Grafting Technique	24
	2.4	Estimation of Fructose	26
	2.5	I.R. Studies	26
	2.6	X-ray Analysis	27
	2.7	Average Diameter	29
	2.8	Mechanical Properties	30
	2.9	Dye-Uptake	31
	2.10	Moisture Regain	32

Page No.

2.11 Determination of Solubility 33

2.12 SEM Studies 34

2.13 Thermogravimetric Analysis 34

2.14 Differential Thermal Analysis 36

2.15 Limiting Oxygen Index 36

2.16 Determination of Melting Point 37

PART III RESULTS AND DISCUSSION

CHAPTER 3 GRAFT COPOLYMERISATION OF VINYL MONOMERS ONTO NYLON 6 FIBRE IN WATER-ALCOHOL MEDIUM

3.1 Graft Copolymerisation of MMA onto Nylon 6 Fibre in Water-Alcohol Medium 39

3.2 Graft Copolymerisation of EMA onto Nylon 6 Fibre in Water-Alcohol Medium 49

3.3 Graft Copolymerisation of n-BMA onto Nylon 6 Fibre in Water-Alcohol Medium 60

CHAPTER 4 GRAFT COPOLYMERISATION OF VINYL MONOMERS ONTO NYLON 6 FIBRE IN WATER AND WATER-ALCOHOL MEDIUM IN PRESENCE OF SACCHARIDE

4.1 Graft Copolymerisation of Vinyl Monomers onto Nylon 6 Fibre in Water Medium in Presence of Fructose 73

4.2 Graft Copolymerisation of Vinyl Monomers onto Nylon 6 Fibre in Water-Alcohol Medium in Presence of Fructose 88

4.2.1 Graft Copolymerisation of MMA onto Nylon 6 Fibre in Water-Alcohol Medium in Presence of Fructose 90

Page No.

4.2.2 Graft Copolymerisation of EMA onto Nylon 6 Fibre in Water-Alcohol Medium in Presence of Fructose 107

4.2.3 Graft Copolymerisation of n-BMA onto Nylon 6 Fibre in Water-Alcohol Medium in Presence of Fructose 122

CHAPTER 5 STRUCTURAL CHANGES BY GRAFTING OF VINYL MONOMERS ONTO NYLON 6 FIBRE

5.1 I.R. Studies 138

5.2 X-ray Studies 141

5.3 Average Diameter 148

CHAPTER 6 MECHANICAL AND OTHER PROPERTIES OF VINYL MONOMERS GRAFTED ONTO NYLON 6 FIBRE

6.1 Mechanical Properties 155

6.2 Dye-Uptake 157

6.3 Moisture Regain 160

6.4 Determination of Solubility 162

6.5 SEM Studies 164

CHAPTER 7 THERMAL PROPERTIES OF VINYL MONOMERS GRAFTED ONTO NYLON 6 FIBRE

7.1 Thermogravimetric Analysis 168

7.2 Differential Thermal Analysis 175

7.3 Flammability Studies 177

7.4 Melting Point 178

CHAPTER 8 SUMMARY AND CONCLUSIONS 180

REFERENCES 186

LIST OF PUBLICATIONS