

**RADIATION INDUCED GRAFT - COPOLYMERISATION
OF METHYL METHACRYLATE ON NATURAL,
MODIFIED WOOL**

**BY
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**SUBMITTED IN
FULFILMENT OF THE REQUIREMENT OF
THE DEGREE OF DOCTOR OF PHILOSOPHY**

**TO THE
INDIAN INSTITUTE OF TECHNOLOGY, DELHI
AUGUST, 1978**

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CERTIFICATE

This is to certify that the thesis entitled "Radiation induced graft-copolymerisation of methyl methacrylate on natural and modified wool" being submitted by Mr. R.K. Sadhir to the Indian Institute of Technology, Delhi, for the award of the degree of Doctor of Philosophy in Textile Technology, is a record of bonafide research work carried out by him. Mr. R.K. Sadhir has worked under my guidance and supervision and has fulfilled the requirement for the submission of this thesis which 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 degree or diploma.

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ACKNOWLEDGEMENTS

I sincerely wish to express my deep sense of gratitude to Professor D.S. Varma, Department of Textile Technology, Indian Institute of Technology, Delhi, for his unstinted encouragement and painstaking supervision throughout this work. But for his excellent guidance, this work would not have attained this standard.

I am highly indebted to Professor Dr. (Mrs.) I.K. Varma, Department of Chemistry, I.I.T. Delhi for her kind interest, active help and invaluable discussions at every stage of this work.

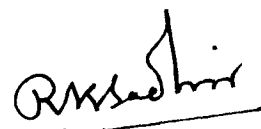
I am also grateful to Dr. R.M. Acharya, Director, Central Sheep and Wool Research Institute, Avikanagar for granting me permission to continue this programme.

Thanks are due to Life Sciences Department, Jawahar Lal Nehru University, for providing γ -irradiation facilities and CDRI Lucknow for elemental analysis.

I feel it a pleasure to acknowledge the cordial and everhelpful environment provided by my colleagues and friends both in Textile Department, IIT Delhi and wool Science Division, CSWRI Avikanagar. My thanks are also due to my brothers Mr. S.K. Sadhir and Mr. V.K. Sadhir who helped me during the compilation of this thesis.

Council of Scientific and Industrial Research,
New Delhi, India is also acknowledged for the financial
assistance provided for carrying out this work.

Last but not the least, I thank Mr. Rajesh Arora
for the neat and accurate typing and Mr. N.L. Arora for
tracing the figures.

A handwritten signature in black ink, appearing to read 'R.K. Sadhir', written in a cursive style. The signature is positioned above a horizontal line.

(R.K. Sadhir)

ABSTRACT

Gamma rays induced graft-copolymerisation of methyl methacrylate (MMA) onto wool fibres (Indian Malpura wool) and the structure and property evaluation of graft copolymers forms the basis of the present thesis. The effect of radiation dosage, solvent and chemical modification of wool (i.e., reduction, methylation, oxidation and cross-linking) on the extent of grafting was investigated. The grafting efficiency was found to be maximum in methylated wool. The molecular weights of the grafted chains determined after separation from the wool were found to be higher than the homopolymer formed under the same reaction conditions. The grafted wool samples were characterised by elemental analysis and ir technique.

α - β transformation were studied by X-ray diffraction by extending the fibres to various % extension. Such transformations were found to be inhibited in grafted samples. The average crystallite size increased and the degree of orientation decreased with the extent of grafting.

Scanning electron microscopy (SEM) was used to examine the topography, peeled surfaces and cross-sections of the grafted wool samples. On the basis of X-ray and SEM data, it has been concluded that the grafted polymer is present in the cortex as well as in the medullae of the fibres.

Sorption and desorption studies of all the samples was carried out and the data was analysed in the light of Hailwood and Horrobin equation. Mechanical properties of pure and medullated wool fibres grafted with MMA were investigated in both water and air. The deposition of the rigid polymer increased the slopes in Hookean, yield and post-yield region. Bulk resilience and elastic recovery were also determined. The density of the fibres decreased with the extent of grafting.

Thermal behaviour of the grafted samples was evaluated by TGA in air and DTA in nitrogen.

CONTENTS

	<u>Page</u>
LIST OF FIGURES	
GENERAL INTRODUCTION	
CHAPTER 1	REVIEW OF LITERATURE
1.1	Gross structure of wool 1
1.2	The fine structure of wool 3
1.3	Chemical modification of wool fibre 7
1.4	Methods of preparation of graft copolymers 17
1.5	Grafting sites in wool 32
1.6	Application of graft copolymers 34
CHAPTER 2	PREPARATION AND CHARACTERISATION OF GRAFT COPOLYMERS OF MMA WITH NATURAL AND CHEMICALLY MODIFIED WOOL
2.1	Introduction 37
2.2	Experimental 42
2.3	Results 49
2.4	Discussion 62
CHAPTER 3	SORPTION BEHAVIOUR AND DENSITY MEASUREMENTS
3.1	Introduction 71
3.2	Experimental 76
3.3	Results 78
3.4	Discussion 82

	<u>Page</u>	
CHAPTER 4	CRYSTALLINE AND MORPHOLOGICAL STRUCTURE	
4.1	Introduction	91
4.2	Experimental	95
4.3	Results and discussion	100
CHAPTER 5	MECHANICAL PROPERTIES	
5.1	Introduction	110
5.2	Experimental	116
5.3	Results	121
5.4	Discussion	132
CHAPTER 6	THERMAL BEHAVIOUR	
6.1	Introduction	140
6.2	Experimental	143
6.3	Results	146
6.4	Discussion	153
CHAPTER 7	GENERAL DISCUSSION AND SUMMARY	
7.1	Sources of error	158
7.2	General discussion and summary	161
7.3	Suggestions for future work	168
	REFERENCES	i to xvii
	LIST OF PUBLICATIONS	
	BIO-DATA	