Polyester (polyethylene terephthalate), is one of the most successful and versatile synthetic fibres. The present work is on structure-property relationship of four different types of polyester industrial yarns (1000 denier) at different stages of its processing for specific applications. Four types of polyester industrial yarns chosen in this study are High modulus low shrinkage (HMLS), High tenacity (HT), Low shrinkage (LS) and Super low shrinkage (SLS). Summarily, the objectives of the present work are:

- To develop structure-property relationship of four major types of polyester industrial yarns and to illustrate their structural differences.
- To develop a relationship between the structural changes & the consequent changes in properties that occur in the downstream processes and the key properties of the parent yarns.
- To investigate how the key properties of the parent yarns / cords are changed during accelerated performance tests of the final products in laboratory and its linkages with the structural parameters.

The deeper understanding on structure-property relationship is expected to help for developing new variants of polyester yarns and new products.

A great deal of research works have been carried out in the past in the area of polyester fibre morphology. However, no comprehensive published work is available on structure-property relationship amongst different types of polyester industrial yarns produced from the same quality of polymer chip (intrinsic viscosity: around 0.90). Some of the challenges which have been attempted to be met in the present work are:

- Structure-property relationship of polyester industrial yarn (HMLS) from yarn stage up to flex fatigue stage.
- Understanding on morphological transformations of polyester industrial yarn from undrawn yarn to drawn yarn stage.
- Structural changes of polyester industrial yarns during dipping and heat setting process and its influence on dipped cord properties.
Challenges and the objectives of the topic as mentioned above prompted the undersigned to undertake this project. The work involves preparation of the undrawn and fully drawn yarn samples in the production spinning machines of SRF Ltd., Chennai, preparation of intermediate / final products in the pilot plants / production machines of SRF Ltd., characterization of yarns, intermediate and final products at the R&D centre of SRF Ltd. Chennai, National Chemical Laboratory (NCL), Pune, Harishankar Shinghania Elastomer and Tyre Research Institute (HASETRI), Rajasthan and University colleges of Science & Technology, University of Calcutta and finally to collate the properties with structure and morphologies of different types of polyester industrial yarns. Thus this dissertation is expected to provide appropriate replies to different queries associated with structure and property development of the commercial industrial polyester yarns.

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