Preface

Particulate fillers are used as reinforcing agents in rubber, among which carbon black and silica are the most efficient. Carbon black is the largest tonnage filler being used in rubber as a reinforcing agent. On thermodynamic ground also it is the preferred filler for general purpose rubbers. However, due to ecological reasons and the requirements of the products such as high performance tyres, where low rolling resistance is of prime importance, use of silica as a filler in rubber, either for complete or partial substitution of carbon black, is on the increase. The polar surface of silica results in poor rubber-filler interaction and higher filler-filler interaction. In comparison with a carbon black filled rubber, the higher surface polarity of silica also causes poor processability, cure retardation and inferior vulcanizate properties. For effective reinforcement with silica, filler surface modifier or coupling agent is to be used. Silane coupling agents are the most efficient ones. However, the high cost of silanes is a limitation for the widespread use of silica/silane technology. The present thesis reports the use of epoxidised natural rubber (ENR) as a reinforcement modifier for silica filled rubbers in comparison with silane modified and carbon black filled systems. The reinforcement modification of silica filled rubbers with ENR was made by substituting a portion of the base rubber with ENR, which has a better affinity to silica than the conventional rubbers.

The thesis is presented in nine chapters. The first chapter discusses the basic concepts of reinforcement of rubbers. A review of the developments in the field of
particulate filler reinforcement of rubbers, with special reference to carbon black and silica fillers was made. Scope and objectives of the study are also discussed. The experimental techniques and details of the equipment used for the study are described in chapter two. Chapter three to seven describes the use of ENR as a reinforcement modifier in silica filled natural rubber (NR) in comparison with corresponding silane modified and carbon black filled NR with respect to its impact on processibility, filler dispersion, technological and dynamic mechanical properties. Also the effects of filler loading and cure systems in various silica filled systems are reported. Chapter eight discusses the use of ENR as a reinforcement modifier in silica filled nitrile rubber (NBR) in comparison with the corresponding silane modified and carbon black filled. Chapter nine gives a summary of the findings, scope for future studies and conclusions.