Preface

Accelerators play a significant role in the vulcanization of natural and synthetic elastomers and their suitable blends. In vulcanization reaction, an accelerator that is absolutely safe at the processing temperature and which can help faster cure, can be considered as ideal. By synergic action, binary accelerator systems can cause faster and effective cure during vulcanization of elastomers. Due to the advantageous properties of vulcanized rubber compared to unvulcanized rubber, introduction of new accelerator systems that can improve the quality of rubber articles is still a demanding issue.

In this research work, a systematic investigation on the effect of novel binary accelerator system on the technological properties of natural rubber, styrene-butadiene rubber, nitrile rubber, and blends of natural rubber / styrene-butadiene rubber and natural rubber / nitrile rubber has been carried out. The thesis entitled “Binary accelerator systems in rubber vulcanization” contains two parts. Part I includes the study on the effect of the novel binary accelerator system on the properties of microcomposites of natural rubber, styrene-butadiene rubber and a blend of the two rubbers. Part II contains the study on the effect of the novel binary accelerator system on the properties of nanocomposites of natural rubber, and a blend of nitrile rubber and natural rubber.

Part I consists of five chapters. Chapter I is a brief introduction of the various aspects like significance of vulcanization, methods of vulcanization, mechanism of vulcanization, significance of binary accelerator systems, various properties of vulcanized elastomers etc. A systematic review of the
earlier studies is also included. The chapter ends with the inspiration and objectives of the present study. Chapter II describes various materials and their details and the experimental methods adopted for the study. Chapter III discusses the study on the effect of the novel binary accelerator systems BIAT / CBS, BIAT / TMTD and BIAT / MBTS on the technological properties of microcomposites of natural rubber. Chapter IV describes the study on the effect of BIAT / TMTD binary accelerator system on the technological properties of styrene-butadiene microcomposites. Chapter V discusses the study on the effect of BIAT / TMTD binary accelerator system on the technological properties of styrene-butadiene / natural rubber blend.

The second part of the thesis contains five chapters. Chapter I is a brief introduction of the various aspects of nanotechnology including methods of synthesis of nanoparticles, characterization and application of nanoparticles, characterization of nanocomposites etc. Significance and objectives of the study are also given after presenting a review of the earlier studies. Chapter II discusses the materials required for the study and the experimental methods used. Chapter III is a description of the synthesis and characterization of the nano-ingredients used in the present investigation. Chapter III also discusses the effect of nano-ingredients on the technological properties of natural rubber vulcanized using the binary accelerator system nano BIAT/ TMTD. The study on the effect of nano-ingredients on the technological properties of natural rubber / nitrile rubber blend (20/80) cured using the binary accelerator system nano BIAT/ TMTD has been discussed in chapter IV. Transport properties, thermogravimetric analysis, dielectric properties and property modeling are also discussed in chapter IV. The last chapter contains the final conclusion of the studies reported in part I and II and also the future scope of the present studies.