PREFACE

So far there has been but little systematic work on the effect of fillers on vulcanization, network structure and failure properties of rubber. In the present thesis we have studied some aspects of this subject with emphasis on coupling agents. The subject matter of this thesis has been presented in nine chapters.

Chapter I deals with a brief review of earlier work in this field and the scope of the present investigation.

The experimental procedure and analytical techniques adopted in this work have been described in Chapter II.

Chapter III is divided into two parts. The first part includes results of the studies on the effects of the interaction of the vulcanization systems [conventional (CONV)

and efficient vulcanization (EV)] and filler (HAF black, N 330) concentration on the technical properties and network structure of natural rubber vulcanizates. The second part deals with the changes in failure mode of natural rubber [reinforced with HAF black (N 330) and vulcanized by two systems (CONV and EV)] by SEM.

Chapter IV reports how the reinforcing silica filler affects the vulcanization, network structure and technical properties of NR in the presence of activators (TEA and EG) and a coupling agent (Si-69).

In Chapter V, the effect of clay in the presence of silane coupling agents (A-172 and Si-69) in sulfur vulcanization and in the presence of A-172 in peroxide vulcanization of NR is analyzed by studies on network structure, technical properties of vulcanizates and scanning electron micrographs of fracture surfaces.

Chapter VI consists of studies on polymer-filler interaction, network structure, technical properties and fracture mode of silica- and clay-filled EPDM rubber in presence of tetrasulfide silane coupling agent (Si-69).

Chapter VII reports results of the studies on the effect of increasing addition of reinforcing carbon black

(ISAF, N 220) on network structure, technical properties and failure mode of EPDM rubber vulcanizates. Two vulcanizing systems [high sulfur (HS) and low sulfur (LS) systems] have been chosen in the studies.

Chapter VIII consists of studies on the effect of silica on vulcanization, network structure, polymer-filler interaction, technical properties and failure mode of EPDM rubber in presence of A-172. Here dicumyl peroxide has been chosen as the vulcanizing agent.

In Chapter IX, the role of titanate coupling agent in silica and black filled natural rubber has been studied. Here three different amounts (1, 2.5 and 5.0% wt. of filler) of KR 38S were incorporated at a fixed loading (30 phr) of filler to find out its effects on the curing characteristics, rubber-filler interaction and technical properties of the vulcanizates.