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CURRENT STATUS OF SULPHUR VULCANIZATION AND DEVULCANIZATION CHEMISTRY: PROCESS OF VULCANIZATION

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The article presents the first part of the review on the current status of sulphur vulcanization and devulcanization chemistry. The purpose of presenting a review of the chemistry of sulphur vulcanization and devulcanization was to develop a devulcanization process and also to address the issue of very low scorch during revulcanization.

Accelerated sulphur vulcanization is a very complex chemical process. Although consensus on various reaction mechanisms are yet to reach, there is widespread agreement about three basic steps involved. These are: (i) accelerator chemistry in which the reactions of accelerator, activator and sulphur leading to the formation of an active sulphurating agent (ii) crosslinking chemistry which involves the reactions of the active sulphurating agent leading to the formation of crosslink precursors and subsequent reactions of these precursors to form polysulphidic crosslinks and (iii) postcrosslinking chemistry leading to chain shortening and degradation of the polysulphidic crosslinks and other main chain modifications. The current understanding of the chemical reactions and the underlying mechanism involved in these basic steps, both in accelerator, activator and sulphur as well as accelerator- cum- sulphur donor and activator cure systems are reviewed. Reaction mechanisms leading to scorch delay inherent to sulphenamide accelerators and those involved by the addition of prevulcanization inhibitors are also presented.

Keywords: Accelerator chemistry, Crosslinking chemistry, Postcrosslinking chemistry, Sulphur vulcanization

INTRODUCTION

The life history of natural rubber (Heideman, 2004; www.britannica.com.; Aprem, *et al.*, 2005) can be dated back to 11 June 1496, the day on which Christopher Columbus returned from his second voyage, bringing back the first rubber balls from the West Indies. The next landmark was the Spanish discovery of the use of latex for the water proofing of leather and fabrics in 1615. The rubber industry in Europe really started with Charles Macintosh in 1818, when he started exploiting the naphtha-based rubber solution as a water proofing layer between

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