

**THE EFFECT OF ZINC DISORBATE AS A SELF-HEALING AGENT ON THE
MECHANICAL AND PHYSICAL PROPERTIES OF IONICALLY GRAFTED
NATURAL RUBBER**

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ABSTRACT

THE EFFECT OF ZINC DISORBATE AS A SELF-HEALING AGENT ON THE PROPERTIES OF IONICALLY GRAFTED NATURAL RUBBER

In this study, sorbic acid (SA) was used to graft zinc disorbate on the natural rubber (NR) using in situ method with zinc oxide (ZnO). The study was done by varying the amount of SA (0-12 parts per hundred part of rubber) to graft zinc disorbate (ZDS) onto the rubber chain. The effect of ZDS was studied on tensile properties, crosslink density and fourier transform infrared (FTIR) analysis. The FTIR spectra shown the formation of carboxylate salt at 1592 cm^{-1} which proves that ZDS is properly grafted onto the NR chain. ZDS played an important role as a self-healing agent and improved the tensile properties and crosslink density of the NR/DCP compound. The study reveals that the tensile strength increased with the increment of sorbic acid (SA). The sample with 12 phr SA shows the highest tensile strength before and after self-healing at 11.21 MPa and 0.80 MPa respectively. The study also found that compound with 12 phr SA exhibited the highest crosslink density. It proved that the presence of ZDS in rubber chain will provide reinforcement on the NR and confirmed that ZDS is potentially can be a suitable substance to act as a self-healing agent.

ABSTRAK

KESAN ZINK DISORBAT SEBAGAI EJEN PENYEMBUH SENDIRI TERHADAP SIFAT-SIFAT MEKANIKAL GETAH YANG DICANTUM SECARA IONIK

Dalam penyelidikan ini, asid sorbik digunakan untuk membentuk zinc disorbat (ZDS) dalam rantaian getah asli dengan menggunakan tindak balas zink oksida (ZnO) secara *in-situ*. Penyelidikan ini dijalankan dengan mengubah jumlah asid sorbic yang digunakan adalah 0-12 bahagian per seratus getah (bsg) untuk membentuk zink disorbat dalam rantaian getah. Kesan ZDS diuji pada sifat-sifat tegangan, sambungan silang, dan analisis spektroskopi inframerah transformasi Fourier (FTIR). FTIR spektra menunjukkan pembentukan garam karboksilat pada 1592 cm^{-1} yang membuktikan ZDS telah berjaya dibentuk pada rantaian-rantain getah asli. Zink disorbat memainkan peranan penting sebagai ejen penyembuhan sendiri dan menambah baik sifat-sifat mekanikal getah.. Hasil dari ujian menunjukkan bahawa, kekuatan tegangan maksimum meningkat dengan peningkatan asid sorbic. Kompaun dengan 12 bsg SA menunjukkan bacaan kekuatan tegangan tertinggi untuk sebelum dan selepas penyembuhan pada 11.21 MPa dan 0.80 MPa. Ujian pembengkakan juga dijalankan pada semua kompaun dan kompaun dengan 12 bsg asid sorbic menunjukkan bacaan