SELF-HEALING NATURAL RUBBER ON METAL DISORBATE IONIC NETWORK

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ABSTRACT

SELF-HEALING NATURAL RUBBER BASED ON METAL DISORBATE IONIC NETWORK

One of the most critical environmental issues is the improper disposal and processing of rubber waste. Investing in the development of self-healing properties of natural rubber (NR) would have a significant impact on the industry and environment. The concept of self-healing has been developed to extend the life of rubber goods by fully or partially correcting localised mechanical damage without compromising structural reliability or requiring operator intervention. In this study, the self-healing capabilities of NR are investigated with different loadings of zinc disorbate (ZDS) as a self-healing agent. ZDS was added to the NR compound using a peroxide vulcanization system with a varying ZDS content. The tensile properties of the NR-grafted ZDS vulcanizate were determined before and after the healing process to determine the self-healing efficiency. Fourier transform infrared spectroscopy (FTIR) and crosslink-density studies provided evidence of reversible ZDS ionic networks. Compared to unfilled NR, the results show that the addition of ZDS successfully induces the vulcanizates to self-repair and recover when damaged. The FTIR result showed that ZDS successfully grafted onto NR molecular chains. The scanning electron microscopic images showed that the ZDS-grafted NR can repair itself, as evidenced by the small distance between the two fractured samples. The tensile test and the microscopic images of NR/4ZDS revealed that it was the best sample among the others. Thus, this study has shown the potential of ZDS to induce the self-healing function in NR vulcanisates.