

UNIVERSITI TEKNOLOGI MARA

**DEVELOPMENT OF EPDM-BASED
HIGH GCC LOADING
WEATHERSTRIP SEAL
VULCANIZATES**

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Thesis submitted in fulfillment
of the requirements for the degree of
Master of Science

Faculty of Applied Sciences

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AUTHOR'S DECLARATION

I declare that the work in this thesis was carried out in accordance with the regulations of Universiti Teknologi MARA. It is original and is the result of my own work, unless otherwise indicated or acknowledged as referenced work. This thesis has not been submitted to any other academic institution or non-academic institution for any degree or qualification.

I, hereby, acknowledge that I have been supplied with the Academic Rules and Regulations for Post Graduate, Universiti Teknologi MARA, regulating the conduct of my study and research.

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ABSTRACT

Development of low cost products with similar or better properties is vital to its sustainability in the competitive global market. This research embarks on compositional analysis of the hard part of a weatherstrip seal product that surpassed customer's specification and development of a new formulation which incorporated ground calcium carbonate (GCC) as a secondary filler for cost reduction. Qualitative and quantitative analysis of the conformable rubber product were carried out using soxhlet extraction for extraction of the additives; and characterization techniques which include spectroscopic, chromatographic, X-ray diffraction and several thermal techniques. Test pieces from 8 new formulations were tested for their mechanical performance. Thermal analysis confirmed the presence of EPDM and carbon black in the compound. Fourier Transform Infrared (FTIR) and chromatographic analysis confirmed the processing oil in the compound to be of paraffinic origin. Presence of talc filler was proven by elemental analysis using X-ray Diffraction (XRD) and Energy Dispersive X-ray (EDX). Reformulation of the compounding ingredient with the incorporation of GCC were varied from 0 to 140 phr. At higher loading of GCC (40 to 140 phr), it shows an increase of hardness with the decrease of tensile strength, elongation at break and tear strength. Nevertheless, the mechanical properties of the new formulated vulcanizates (40 to 140 phr) were varied within customer's specification. It was also determined that the minimum amount of EPDM and CB allowed for significant contribution to the tensile and tear strength properties are 28.2 % each (equiv. to 100 phr GCC). Beyond this composition the effect is diluted by GCC. Estimation of product cost shows that an overall material cost reduction of 23.9 % are achievable at 35.5 wt % incorporation of GCC to the compound.

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