

## **THE DEVELOPMENT OF A PROTOCOL FOR IDENTIFYING AND QUANTIFYING THE CURATIVES IN A RUBBER VULCANIZATE**

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### **ABSTRACT**

Rubber analyses for curatives such as zinc and sulphur have been carried out for many generations. The main concern for the identification and quantification of these curatives are in terms of recycling. Rubber tyre recycling was implemented to car tyre manufacturers in that nearly 65% of rubber compounds produced worldwide is used by the tyre industry. Truck, car, and airplane tyres have been used as tyre derived fuel (TDF) for cement kilns, and as filler for virgin rubber blends that will be re-vulcanized. The knowledge of the amount of zinc and sulphur in rubber tyres is thus essential in establishing the amount of crumb rubber that needs to be added to the virgin rubber. The concern with rubber recycling also poses in the environmental sense. The curatives in rubber can be leached out of waste tyres and be harmful the environment. Many fires that have lasted days have been due to large rubber tyre landfills that have been left unattended. The consistent quantification of zinc and sulphur has thus formed the basis of nature conservation. Three crumb rubber tyres were analysed for their zinc and sulphur contents, including processing oil, gel and plasticiser. The oils and gels constituents were qualified using therogravietric analysis and Infrared radiation. The average zinc in rubber tyres was determined by using Atomic Absorption Spectroscopy, and the presence of zinc in the rubber samples was confirmed by X-Ray Fluorescence. The results indicate that the concentration of zinc ranged from 0.9 – 2.0%. Quantification if zinc in the oils and gels proved unsuccessful. The sulphur in the rubber samples was determined using the oxygen flask method. Volumetric and precipitation gravimetric analysis was used as quantification methods. The results further indicate that the concentration of sulphur in the rubber samples were between 0.5 -2.0% for precipitation gravimetric analysis, and contained errors for volumetric analysis.

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