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THERMAL ANALYSIS OF RUBBERS AND RUBBER PRODUCTS

by

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ABSTRACT

The possible applications of commonly used thermal analytical techniques, including differential scanning calorimetry (DSC), thermogravimetry (TG) and dynamic mechanical analysis (DMA), to analysis and characterisation of rubber and rubber products were explored. For DSC, the applications to isothermal measurement of vulcanisation characteristics of rubber compounds, measurement of free sulphur content in rubber vulcanisates, determination of type of sulphur- vulcanisation system of the vulcanisates and determination of curative levels (accelerator and sulphur) were studied. The results showed that DSC is only suitable for the last two applications, particularly for quality control purpose. For TG, studies were made for its applications to compositional analysis of rubber products and also to determination of carbon black type. The results obtained confirm previous reports that TG is a useful and convenient method for determination of the main components of rubber products (rubber, carbon black). The quantities of other ingredients such as oil and plasticiser or the composition of rubbers in rubber blends may also be determined but favourable experimental conditions must be found. Overall, it was found that results obtained with TG depend a great deal on operational conditions of the instrument and that optimum conditions must first be established for the instrument employed. For DMA, attempts were made to apply the technique to vulcanisation characteristic measurement of rubber compounds, similar to the use of cure rheometer. The present investigation showed limitation of DMA for this application, due primarily to the failure to prepare soft compounded rubber sample in suitable forms.