

CORRELATION OF CURE PARAMETERS OF RUBBER FROM DIFFERENT RHEOMETERS

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The present trend in the rubber industry is to increase the test temperature in order to reduce testing time and increase productivity of the rheometer. This is claimed to be possible with the new rheometers viz., the Oscillating Disk Rheometer (ODR2000) and the rotorless Moving Die Rheometer (MDR 2000) which have been introduced to replace old models like TM100. The temperature recovery on the ODR 2000 and MDR2000 was found to be between 30 and 50 seconds, while it was around 6 minutes on TM100. Comparative studies among these three rheometers using rubber compounds of varying cure systems have been carried out. Comparison of the cure curves or parameters, at a particular test temperature, showed that there were only slight differences between TM100 and ODR2000. However, there were significant differences between TM100 and MDR2000 and likewise between ODR2000 and MDR2000. At a specified test temperature for a compound, the rheometers gave values of cure parameters viz., scorch time, cure time and cure rate in the following order: MDR2000<ODR2000<TM100. The ranking for the delta torque values, however, is ODR2000, TM100>MDR2000. Statistical analysis on the cure parameters of natural rubber compounds was also carried out to examine the relationship of the values obtained between these rheometers.

Key words : Natural Rubber, Rheometer, Cure parameters, Curometer, Cure characteristics.

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INTRODUCTION

The first step in the manufacture of rubber products is mixing of rubber and various compounding ingredients to give a homogeneous mixture or compound. Prior to the compound being utilised in the downstream process, it is essential to check its cure characteristics for which curometers are being used. These instruments are used to test materials according to the American Society for Testing and Materials Standard D-2084 and the International Standards Organisation Standard 3417. Currently, the most common curometers used in the

rubber industry are the rheometers TM 100 and R 100 S. Recently, two new models, the Oscillating Disk Rheometer (ODR 2000) and a rotorless Moving Die Rheometer (MDR 2000) have been introduced and the older ones are phasing out (Sczna *et al.*, 1988; DiMauro *et al.*, 1989).

The present trend in the rubber industry is to increase the test temperature in order to reduce testing time and increase the productivity of the rheometer. This is difficult with the TM100 rheometer where the temperature recovery time was found to be in the region of six minutes. The new

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