

UNIVERSITI TEKNOLOGI MARA

**THE EFFECT OF ACCELERATORS
TOWARDS THE CURE
CHARACTERISTICS AND
PHYSICAL PROPERTIES OF THICK
RUBBER ARTICLE**

SITI ZULAIKHA BINTI IBRAHIM

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ABSTRACT

This research has been carried out to investigate new approach for curing thick rubber article of 20 cm by height using different combination of accelerators. Five batches of natural rubber, SMR L compounds were prepared with different types of accelerators combinations and curing temperature. The accelerators used were N-cyclohexylbenzothiazole-2-sulphenamide (CBS), diphenyl guanidine (DPG) and zinc diethyl dithiocarbamate (ZDC). The three types of accelerators at different amount and combination for different compound were adjusted according to the state of cure of control sample. The control sample were cured at 140 °C and only CBS was used as single accelerator. The other four samples were prepared using accelerators combination at different curing time, named as UR130, UR120, UR110 and UR100. Compound UR130 and UR120 were cured at 130 °C and 120 °C respectively with the combination of CBS and ZDC combination. Meanwhile, combination of ZDC and DPG were cured at 110 °C (UR110) and 100 °C (UR100). All the samples were prepared using two roll-mills. The selection of temperature for curing at 140 to 100 °C was based on an expected temperature gradient of curing the thick rubber article. The objective of this study is to uniformly cure the thick rubber article, at three different temperature regions with different combination of accelerator. The results of curing time obtained for control sample of unfilled rubber compound (UR140) with CBS accelerator at 140 °C was 20 minutes. Meanwhile, for the sample combination of CBS and ZDC, UR130 and UR120, the curing time obtained were 21 and 19 minutes respectively. The curing time for ZDC and DPG combination of UR110 and UR100 was 18 and 22 minutes respectively. The results show only ± 2 minutes differ with the control sample. The shortest cure time was shown by the sample with combination of CBS and ZDC accelerator cured at temperature 120 °C (UR120). Meanwhile, UR100 (100 °C) showed the longest cure time at 22 minutes. Moreover, combination and amount of accelerators utilized for filled rubber (FR140, cure time 9 minutes) generates almost identical curing time by 2 minutes as compared with the control unfilled compound. The state of cure of the vulcanized rubbers was measured using tensile and hardness tests. The results of the tensile test for unfilled compound show that all samples have the tensile strength between 24.11 to 26.4 MPa. This is shown that all the sample obtained similar state of cure with the control sample that has tensile strength value of 26.4 MPa. The hardness also shows similar trend as the tensile test. The value obtained were between 42.03 to 44.30 IRHD. Meanwhile, in general all of filled rubber compound samples shows increased in hardness by 63% as compared to unfilled rubber compound. The results for temperature profiles studies indicates that, compound UR120 was the best combination and amount of accelerator to achieve uniform curing time that almost similar to the control sample for curing of thick rubber article.

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