



COMPARATIVE STUDY OF CURING PROPERTIES SSBR BASED SIDE WALL COMPOUND WITH LPCA AND HPCA OILS

Nitin Kumar*, K. S. Meena and R. K. Khandelwal

Department of Chemistry, M. L. V. Govt. College, Bhilwara, Rajasthan-311001, India.

*Corresponding Author: Nitin Kumar

Department of Chemistry, M. L. V. Govt. College, Bhilwara, Rajasthan-311001, India.

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ABSTRACT

Rheology is the study of flow and deformation of materials under applied forces which is routinely measured using a rheometer. The measurement of rheological properties is applicable to all materials – from fluids such as dilute solutions of polymers and surfactants through to concentrated formulations, Rheological properties can be measured from bulk sample deformation using a mechanical rheometer. This study aims to investigate the effect of oils on curing time. it is a time required by the sample to reach a desired state of cure, usually to reach 90% of the maximum cure.

KEY WORDS: low PCA oils, Polycyclic aromatics, carcinogenesis, PAH, risk assessment.

INTRODUCTION

In compounding rubber and rubber composition for use in pneumatic tyre, it is common to utilize processing oils to soften and extend the rubber. Typical, aromatic processing oils, having a certain content of polyaromatic compound have been used recently, regulatory concerns have necessitated the use of processing oils having a lower PCA content.

EXPERIMENTAL

Materials studied are given in Table No.1

Table 1.

	Material Required
1	S SBR having regular aromatic oil
2	S SBR having low PCA oil
3	Regular oil & LPCA OIL No.A,B
4	Filler Carbon black
5	ZnO
6	Stearic Acid
7	6PPD
8	MC Wax
9	MS 40
10	S
11	TBBS
12	DCBS
13	PVI

COMPOUND MIXING

Mixing of rubber compound S SBR having regular aromatic oil and S SBR having low PCA oil are carried

out using a two-wing rotor laboratory Banbury mixer (Stewart Bolling, USA) in three stages (master batch remill and final batch) and the formulations are given in Table No.1

Master batch mixing was done setting the temperature control unit (TCU) at 90°C and rotor speed at 60 rpm. After the power integrator (PI) indicated achievement of 0.32 kWh, the master batch was dumped. The dump temperature of the master batches was found to be within 130 - 160°C. The master batches were sheeted out in a laboratory two-roll mill. Further mixing of the master batches were carried out after a maturing period of 8 hours.

For final batch mixing, the TCU was kept at 60°C and rotor speed at 30 rpm. The earlier prepared master batch was mixed with sulfur, accelerator and scorch inhibitor. The batch was dumped at a PI reading of 0.12 kWh. The dump temperature of the batches was found to be within 90 - 100°C. The final batches were also sheeted out on a laboratory two-roll mill Formulation is according to Table 1.

RESULTS AND DISCUSSION

The detailed of Rheological Properties of Regular sSBR and LPCA sSBR Based Truck Tyre side wall Compound with two LPCA and HPCA Oils are reported as

Table No. 2

RHEOMETRIC PROPERTIES @ 160°C/30min (Final) Regular oil	
MIN TQ. (lb-in)	3.45
MAX.TQ.(lb-in)	16.84
Final TQ.(lb-in)	15.56
tS1 (min)	5.1
tS2 (min)	6.07
tC10 (min)	5.59
tC40 (min)	6.69
tC50 (min)	6.87
tC90 (min)	8.79
Max-Min Tq.(lb-in)	14.39

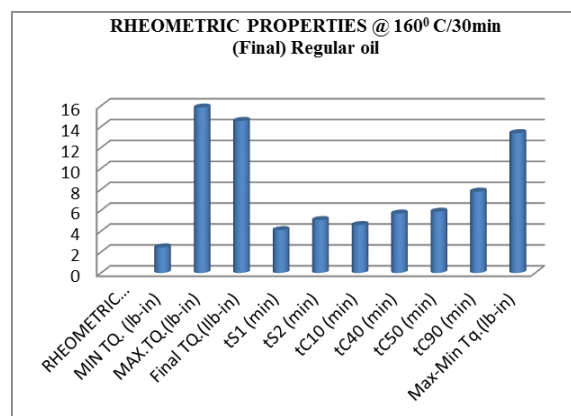


Table No. 3

RHEOMETRIC PROPERTIES @ 160°C/30min LPCA Oils No-1	
MIN TQ. (lb-in)	3.67
MAX.TQ.(lb-in)	16.76
Final TQ.(lb-in)	15.21
tS1 (min)	5.09
tS2 (min)	5.94
tC10 (min)	5.47
tC40 (min)	6.58
tC50 (min)	6.77
tC90 (min)	8.66
Max-Min Tq.(lb-in)	14.09

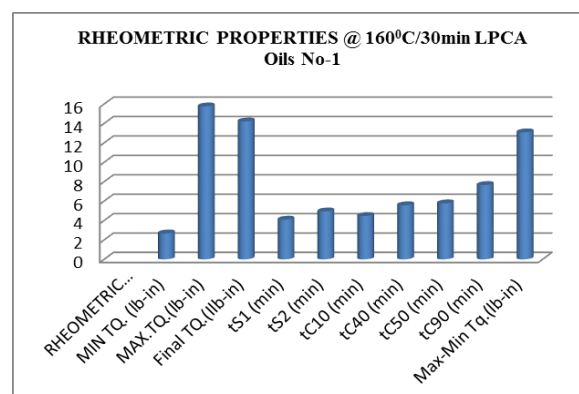


Table No. 4

RHEOMETRIC PROPERTIES @ 160°C/30min LPCA Oils No-2	
MIN TQ. (lb-in)	3.64
MAX.TQ.(lb-in)	16.4
Final TQ.(lb-in)	14.88
tS1 (min)	5.11
tS2 (min)	5.74
tC10 (min)	5.32
tC40 (min)	6.38
tC50 (min)	6.59
tC90 (min)	8.57
Max-Min Tq.(lb-in)	13.76

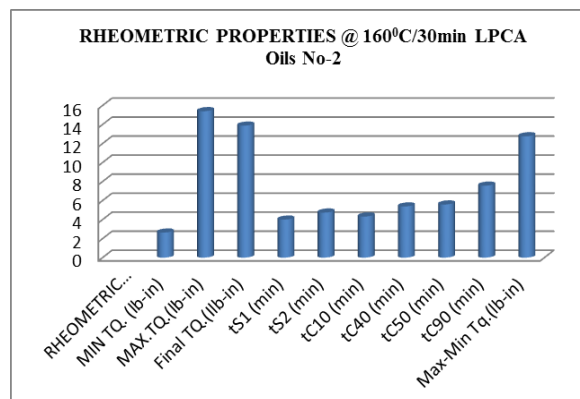
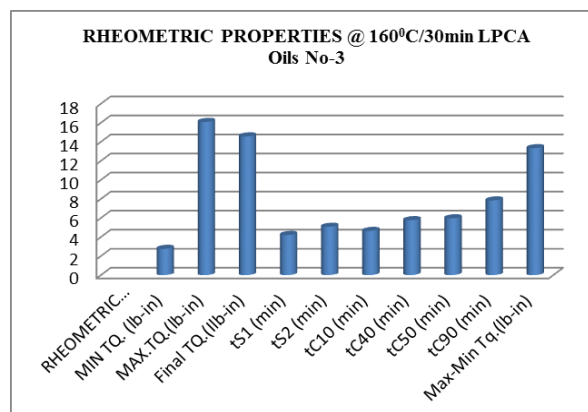


Table No. 5

RHEOMETRIC PROPERTIES @ 160°C/30min LPCA Oils No-3	
MIN TQ. (lb-in)	3.76
MAX.TQ.(lb-in)	17.09
Final TQ.(lb-in)	15.57
tS1 (min)	5.22
tS2 (min)	6.08
tC10 (min)	5.64
tC40 (min)	6.77
tC50 (min)	6.97
tC90 (min)	8.85
Max-Min Tq.(lb-in)	14.33



CONCLUSION

From this study effect of Aromatic contain on curing time of sSBR regular and NR based Truck Tyre side

wall compound with LPCA oils that tC90 is decreases with PCA amount decreases .

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