

RESEARCH PROTOCOL

Comparison of influence of different curing system on electrical resistance of HCR based compounds with TUBALL MATRIX 605

PURPOSE OF THIS STUDY

Evaluation of different curing system and their impact on electrical resistance of HCR based compounds with TUBALL MATRIX 605.

For this study three commercially available curing systems for silicone compounds were chosen.

Peroxides:

- 2,5-bis (tert-butylperoxy)-2,5-dimethylhexane (trade mark DHBP-45-PSI);
- 1,3(4)-bis(tert-butylperoxyisopropyl)benzene (trade mark Luperox F40P)

Curing system based on Platinum catalyst and crosslinker was also tested as a referent, due to most of the conductive compounds use Pt based systems.

OCSiAl also mentioned the following facts:

- 2,4 dichlorobenzoylperoxide (DHBP) – standard peroxide, strong inhibition by any filler;
- Dicumyl Bis (1-methyl-1-phenylethyl) peroxide, Bis(α,α -dimethylbenzyl) peroxide – standard peroxide, not preferable for using, due to strong smell of decomposition products of peroxide.

EXPERIMENTAL PART

1.1. Basic formulation

The following formulation (tab. 1) used for the test:

Curing system type	DHBP-45-PSI		Luperox F40P		Platinum catalyst	
TUBALL MATRIX concentration, wt.%	2	4	2	4	2	4
Elastosil R401/60S, g	256,5	226,5	261	231	-	-
Eurosil A60 P comp. A, g	-	-	-	-	135	120
Eurosil A 60 P comp. B, g	-	-	-	-	135	120
TUBALL MATRIX 605, g	6	12	6	12	6	12
Curing agent.g	13,5	13,5	9	9	-	-
Total, g	276	252	276	252	276	252

Table 1. – Formulation of test rubber compound

1.2. Adding of modifiers

TUBALL MATRIX 605 first should be diluted in 10 times in Elastosil R401/60S and in Eurosil A 60 P comp. A (platinum catalyst system) on two-roll mill PD 500 250/250 according to TUBALL MATRIX 605 dilution guideline.

1.3. HCR sample preparation

Two roll mill PD 500 250/250 was used. Elastosil R401/60S and diluted TUBALL MATRIX mixed on two roll mill after that curing agent was added.

For two component Pt catalyst samples bough components and diluted TUBALL MATRIX mixed together on two roll mill.

Curing parameters provided in table 2.

Curing system	Curing parameters
DHBP-45-PSI	pressure – 200 kgf/cm ² , temperature - 170 °C, time - 5 min.
Luperox F40P	pressure – 200 kgf/cm ² , temperature - 160 °C, time - 6 min.
Platinum curing system	pressure – 200 kgf/cm ² , temperature - 180 °C, time - 5 min.

Table 2. – cutting parameters for different systems

All samples was post cured during 4 hours at 200 °C.

1.4. Test methods

- **Electrical resistivity**

Resistivity of rubber was measured by 4-probe method according to ASTM D257 standard.

2. RESULTS

2.1. Electrical Resistivity

Electrical Resistivity of cured samples is shown in the table 3.

TUBALL MATRIX concentration	2 %	4%
DHBP-45-PSI	203	41
Luperox F40p	141	20
Platinum curing system	241	42

Table 3. – Electrical resistivity of cured samples, Ohm*cm

3. CONCLUSIONS

Electrical resistivity of HCR compounds using peroxide type Luperox F40P is slightly lower than compounds cured with Platinum catalyst and other type of peroxide - DHBP-45-PSI.

Difference between Pt catalyst and DHBP-45-PSI peroxide is not significant in terms on electrical resistivity of HCR silicone rubber.