

- [54] **COMPOSITION FOR THE ADHESION OF RUBBER TO REINFORCING MATERIALS**
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- [52] U.S. Cl. .... **524/512; 260/738; 260/746; 260/765; 260/784; 260/788; 525/155; 525/160; 525/161; 525/164**
- [58] Field of Search ..... **260/3, 3.3, 4 R, 5, 260/3.5, 33.6 AQ, 42.32, 42.33, 738, 765, 788, 746, 784, 42.34, 42.35, 42.36, 42.37, 395 B, 42.14, 42.24; 525/155, 160, 161, 164**
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[57] **ABSTRACT**

A method for adhering rubber to reinforcing materials which comprises embedding a textile fiber or metal reinforcing material in a vulcanizable rubber composition comprising rubber, a sulfur vulcanizing agent, high surface area silica and an N-(substituted oxymethyl) melamine compound.

**5 Claims, No Drawings**



Polyblend Masterbatch Formulation (A)	
	Parts by Weight
Natural rubber	52
Polybutadiene rubber	18
Butadiene/styrene rubber	30
Carbon black	40
Zinc oxide	5
Stearic acid	2
Diphenylamine-acetone reaction product antioxidant (50% active)	2
High Surface area silica	10

## EXAMPLE B

A natural rubber masterbatch formulation is prepared as follows:

Natural Rubber Formulation (B)	
	Parts by Weight
Natural rubber	100
Carbon black	40
Zinc oxide	5
Stearic acid	2
Antioxidant (same as Example A)	2
High Surface area silica	10

In the examples which follow, one or the other of the polyblend or natural rubber formulations is used, in each case in an amount containing 100 parts of rubber.

## EXAMPLE 1

Hexakis(methoxymethyl) melamine is evaluated in Natural Rubber Formulation, (B) as a promoter for the adhesion of brass-coated steel wire to rubber, and compared with a similar composition containing resorcinol. The compositions are vulcanized at 153° C. Data are given below.

Variable	Composition, Parts	
	A	B
Hexakis(methoxymethyl)melamine	3	3
Resorcinol	—	2
Adhesion data are given below.		
Adhesion, kN/m*		
Unaged	40.9	37.7
Aged 4 days/85° C./100% RH	35.1	32.1
Aged 24 hours/90° C./5% NaCl Soln.	7.5	3.5

\*1 kN/m = 5.71 pli

## EXAMPLE 2

The procedure of Example 1 was followed except that Polyblend Masterbatch Formulation (A) is used instead of natural rubber.

Variable	Composition, Parts	
	A	B
Hexakis(methoxymethyl)melamine	3	3
Resorcinol	—	2
Adhesion data are given below.		
Adhesion, kN/m		
Unaged	40.5	42.5
Aged 4 days 85° C./100% RH	30.0	24.8
Aged 24 hours/90° C./5% NaCl Soln.	10.0	8.5

The adhesion data in Examples 1 and 2 illustrate that hexakis(methoxymethyl) melamine provides equal or

better adhesion of brass-coated steel wire to both natural rubber and synthetic rubber compared with the combination of hexakis(methoxymethyl) melamine plus resorcinol. Adhesion in aged rubber stock is significantly better when hexakis(methoxymethyl) melamine is used alone.

## EXAMPLE 3-10

Several N-(substituted oxymethyl)melamine compounds are evaluated for their ability to promote adhesion between brass-coated steel cord and synthetic rubber using Polyblend Masterbatch Formulation (A). The compositions are vulcanized at 153° C. Data are given below. All compositions contain 10 parts of high surface area silica.

Ex. No.	N-(Subst. oxymethyl)melamine	Adhesion, kN/m
—	None (Control)	24.5
3	MF <sub>5,5</sub> Me <sub>5,2</sub> *	36.8
4	MF <sub>5,6</sub> Me <sub>4,5</sub>	32.4
5	MF <sub>3</sub>	36.1, 36.8
6 C	MF <sub>2</sub>	24.3
7	MF <sub>2</sub> Me <sub>2,4</sub>	42.3
8	MF <sub>5,8</sub> Me <sub>5,5</sub>	37.7
9	MF <sub>5,8</sub> Me <sub>1,9</sub> Et <sub>3,6</sub>	37.1
10	MF <sub>5</sub> Bu <sub>4</sub>	36.8

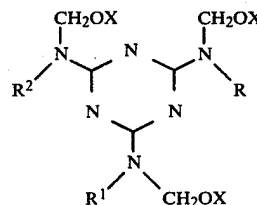
C = Comparative

\*1 Mole of melamine condensed with 5.5 moles of formaldehyde and etherified with 5.2 moles of methanol; average analysis of reaction products. Et represents ethanol; Bu represents n-butanol.

The data illustrate that good adhesion of brass-coated steel cord to synthetic rubber is achieved in the presence of the N-(substituted oxymethyl) melamine compounds using the process of the present invention and in the absence of a methylene acceptor compound such as resorcinol.

We claim:

1. A composition for the adhesion of a textile fiber or a steel cord to rubber in the absence of a methylene acceptor which consists essentially of (1) a vulcanizable natural or synthetic rubber, (2) a sulfur vulcanizing agent, (3) from about 2 to 14 parts, by weight, per 100 parts, by weight, of rubber, of a high surface area silica and (4) from about 1 to 10 parts, by weight, per 100 parts, by weight, of rubber, of an N-(substituted oxymethyl)-melamine compound represented by the formula:



wherein each X represents, individually, hydrogen or a lower (C<sub>1</sub>-C<sub>8</sub>) alkyl radical; R, R<sub>1</sub>, R<sub>2</sub> are, individually, hydrogen, a lower (C<sub>1</sub>-C<sub>8</sub>) alkyl radical, or the group —CH<sub>2</sub>OX.

2. A composition according to claim 1 wherein said rubber is natural, polybutadiene, polyisoprene, ethylene-propylene terpolymer rubber, butadiene-styrene copolymer rubber, butadiene-acrylonitrile copolymer rubber, chloroprene rubber, chlorosulfonated polyethylene or mixtures thereof.

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3. A composition according to claim 1 wherein said melamine compound is hexakis (methoxymethyl) melamine.

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4. A composition according to claim 1 wherein R, R<sub>1</sub>, and R<sub>2</sub> are all —CH<sub>2</sub>—OX groups.

5. A composition according to claim 1 which contains, in addition to the components thereof, carbon black, an antioxidant, zinc oxide and a processing oil.

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