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54 **Use of aminoxides as antistatic agents.**

57 Aqueous antistatic composition comprising 10 - 80 % by weight of an aminoxide and 2.5 - 20 % by weight of a lower alkanol are effective antistatic agents and cause less damage on polyester fabrics than conventional antistatic agents.

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USE OF AMINOXIDES AS ANTISTATIC AGENTS

The present invention relates to antistatic compositions and their use in reducing the propensity of fabrics to accumulate electrostatic charges. More in particular, it relates to the use of aminoxides as antistatic agents on fabrics which comprise polyester.

Many types of fabric have a tendency to accumulate electrical charges. Clothes which are manufactured using such fabrics are then likely to become carriers of electrostatic charges. This is unpleasant for the person who is wearing the clothing, as the mutual attraction of oppositely charged surfaces may lead to lead to clinging of the clothing to the body and to undergarments. Furthermore, static charges may contribute to the soiling of garments, draperies and other textile products by attracting oppositely charged particles of dust and dirt from the atmosphere onto the charged fabric.

The generation of electrostatic charges on fabrics is also undesirable in manufacturing processes of sheets, films, filaments, etc, as the charges tend to cause the articles to cling together or to the processing equipment. Electrostatic charges are particularly dangerous in the manufacturing process of integrated circuits, especially of the MOS-type, as these may be irreversibly damaged by such charges. It is therefore essential that the protective clothing which is worn by the laborers in this branch of industry is treated in such way that accumulation of electrostatic charges is prevented or effectively reduced.

In order to reduce the propensity of fabrics to accumulate electrostatic charges it is known to provide the fabric with a finish of substances which have a high conductivity, such as quaternary ammonium compounds. Such antistatic agents may be added to the fabric in the rinse cycle of the fabric washing process and may provide a surface resistivity in the order of 10^9 ohm/square.

However, it was found that the use of quaternary ammonium compounds as antistatic agents for fabrics may lead to serious chemical damage to the fabric upon repeated washing, especially if the fabric comprises polyester. This damage was found to increase with the amount of quaternary ammonium compound used, such that a compromise must be made between an effective antistatic treatment and an economically acceptable amount of damage to the protective clothing.

We have now found that this damage may be reduced or obviated when an aminoxide is used for reducing the propensity of fabrics to accumulate electrostatic charges.

According to a first aspect, the present invention relates to the use of aminoxides for reducing the propensity of fabrics to accumulate electrostatic charges, especially when the fabrics comprise polyester.

According to a second aspect, the invention provides an aqueous antistatic composition comprising 10 - 80 % by weight of an aminoxide and 2.5 - 20 % by weight of a lower alkanol.

According to third aspect of the present invention, there is provided a method for reducing the propensity of fabrics to accumulate electrostatic charges which comprises treating the fabrics, preferably after or during the rinse cycle of a wash process, with an antistatic composition according to the invention.

Aminoxides are well-known surfactants having a cationic character at low and neutral pH and a nonionic character at alkaline pH. Aminoxides which are advantageously used in the present invention correspond to the general formula:



wherein R_1 and R_3 are independently CH_3 or C_2H_4OH and R_2 is an alkyl group having 12 to 18 carbon atoms. Preferably, R_2 is an alkyl group having 14 to 16 carbon atoms.

Such aminoxides are commercially available, for instance from AKZO Chemie under the trade name "Aromox". They are supplied as solutions having an active content of 30 to 40% by weight in water/isopropanol (50/50) or in water.

The antistatic compositions according to the invention are aqueous compositions comprising 10 to 80% by weight of an aminoxide and 2.5 to 20% by weight of a lower alkanol, preferably isopropanol. Preferably they comprise 20 to 40% aminoxide and 5 to 10% isopropanol.

Surprisingly, it was also found that antistatic compositions containing mixtures of a dimethyl alkyl aminoxide and a bis-(2-hydroxyethyl) alkyl aminoxide, whereby the alkyl groups comprise 12 to 18 carbon atoms, exhibit a more pronounced antistatic effect than compositions which contain either one of these aminoxides.

It is advantageous when the antistatic compositions according to the invention further comprise an anti-foam agent, preferably a silicone oil, in an amount of 0.01 to 1.0 wt%, calculated on the total composition.

The compositions according to the invention may be used after or in the rinse cycle of a wash process for the treatment of fabrics in an amount of 1 to 100 g, preferably 3 to 20 g per kg wash load. Although not
 5 exclusively, the process of the present invention is primarily suitable for industrial applications, such as the industrial cleaning of overalls.

However, the compositions according to the invention may also be used in the pre-wash cycle of such a fabric washing process. In that case it was surprisingly found that the number of fluffs was significantly reduced. This proved to be a significant advantage for the washing of coloured linen for surgery rooms were
 10 conventional wash processes inevitably leave a large number of fluffs which have to be removed manually.

The invention will now be further illustrated by means of the following examples in which the amounts are given as % by weight, unless otherwise indicated. In the Examples, the following abbreviation is used:

ISA : Isopropanol

The following aminoxide products were used which are commercially available from Akzo Chemie:

15 Aromox T/12 : bis-(2-hydroxyethyl) tallow aminoxide

Aromox DMCD : dimethyl coconut aminoxide

Aromox DM16D : dimethyl hexadecyl aminoxide

Aromox DMMCD-W : dimethyl coconut aminoxide, purified

Aromox DM14D-W : dimethyl tetradecyl aminoxide

20 Aromox T/12, DMCD and DM16D contain 40 % by weight of aminoxide in a solvent mixture consisting of 50 % isopropanol and 50 % water. Aromox DMMCD-W and DM14D-W contain 30 % by weight of aminoxide in water.

EXAMPLES 1-21

25 28 kg overalls made of polyester comprising fabric were subjected to a conventional industrial fabric washing process in a Spencer O.E. washing machine. The dosage of detergent product was 5 g/kg and the water hardness was 0 degrees German Hardness. The process consisted of a prewash of 2.5 minutes at 40 °C, a main wash of 6.5 minutes at 55 °C followed by two rinse cycles of 2.5 minutes each. After the last
 30 rinse cycle, the wash load was treated for 5 minutes at 18 °C with the amounts of the various antistatic compositions as indicated in Table I. After draining the overalls were removed and dried for 20 minutes in a tumble dryer at a temperature of 50 °C. The surface resistivity of the overalls was then determined by measuring the resistance of the fabric according to British Standard 5958:1980 using a Philips Model 262 resistivity meter. The results are also shown in Table I. In all cases, the chemical damage which the fabrics
 35 incurred after several washes was much less than when a conventional quaternary ammonium antistatic composition was used.

TABLE I

Ex.	Type of Aminoxyde	Content:	Dosage	Resistivity
		aminoxide isopropanol water	(g/kg)	(log ohm/square)
1.	Aromox T/12	40 30 30	16	9
2.	Aromox T/12	40 30 30	24	9
3.	Aromox T/12	40 30 30	32	9
4.	Aromox DMCD	40 30 30	16	9
5.	Aromox DMCD	40 30 30	24	8-9
6.	Aromox DMCD	40 30 30	32	8-9
7.	Aromox DMMCD-W	30 -- 70	16	9-10
8.	Aromox DMMCD-W	30 -- 70	24	9-10
9.	Aromox DMMCD-W	30 -- 70	32	9-10
10.	Aromox T/12: Aromox DM16D: water (10:20:70)	12 9 79	8	9
11.	Idem,		16	9
12.	Aromox T/12: Aromox DM16D: water (20:40:40)	24 18 58	8	9
13.	Idem,		10	8-9
14.	Aromox T/12: Aromox DMCD: water (5:10:85)	6 4.5 89.5	8	9-10
15.	Idem,		16	9-10
16.	Aromox T/12: Aromox DMCD: water (10:20:70)	12 9 79	8	9-10
17.	Idem,		16	9-10
18.	Aromox T/12: Aromox DM14D-W: water (20:40:40)	20 6 74	10	7-8
19.	Aromox T/12: Aromox DM14D-W: water: isopropanol (20:40:30:10)	20 16 64	10	7-8
20.	Idem, (10:20:65:5)	10 8 82	5	8
21.	Idem,		10	8

EXAMPLES 22-24

5 The effect of an anti-static composition according to the invention was compared with the effect caused by a conventional anti-static agent of the quaternary ammonium type. Samples of three different types of polyester fabrics were soaked for 10 minutes at 40° C and at a liquid to cloth ratio of 20 to 1, using 2 g anti-static agent per litre. Subsequently, the samples were dried for 20 minutes at 60° C. This procedure was repeated 25 times and then the tensile strength of a test cloth having a width of 5 cm was measured (in kg) 10 on a Louis Schopper tensile strength meter Type MT34. The tensile strength is believed to be a good measure of the chemical damage due to the anti-static treatment. The results for three different polyester fabrics are shown below.

TABLE II

Example 22 - Polyester Fabric I.

15	Anti-static Agent:	None	Conventional	Example 20
	Tensile Strength:			
20	in kg/5 cm	140.0	137.2	139.5
	% difference	0.0	2.0	0.4

25 Example 23 - Polyester Fabric II

	Anti-static Agent:	None	Conventional	Example 20
	Tensile Strength:			
30	in kg/5 cm	116.5	112.6	113.4
	% difference	0.0	3.3	2.7

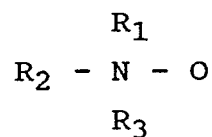
35 Example 24 - Polyester Fabric III

	Anti-static Agent:	None	Conventional	Example 20
	Tensile Strength:			
40	in kg/5 cm	143.7	140.0	143.6
	% difference	0.0	2.6	0.1

45 These results show that the composition of Example 20 according to the invention leads to less chemical damage on all three different types of polyester fabric than the conventional anti-static agent of the quaternary ammonium type.

Claims

- 50 1. Use of aminoxides for reducing the propensity of fabrics to accumulate electrostatic charges.
2. Use according to Claim 1, wherein the fabrics comprise polyester.
3. Aqueous antistatic composition comprising:
 - 55 10 - 80 % by weight of an aminoxide; and
 - 2.5 - 20 % by weight of a lower alkanol.
4. Antistatic composition according to Claim 3, wherein the aminoxide has the formula:



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wherein R_1 and R_3 are independently CH_3 or C_2H_4OH and R_2 is an alkyl group having 12 to 18 carbon atoms.

10 5. Antistatic composition according to Claim 4, wherein R_2 is an alkyl group having 14 to 16 carbon atoms.

6. Antistatic composition according to Claims 3-5, comprising a mixture of a dimethyl alkyl aminoxide and a bis-(2-hydroxyethyl) alkyl aminoxide, whereby the alkyl groups comprise 12 to 18 carbon atoms.

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7. Antistatic composition according to Claims 3-6, wherein the lower alkanol is isopropanol.

8. Antistatic composition according to Claims 3-7, further comprising an anti-foam agent.

20 9. Antistatic composition according to Claim 8, wherein the anti-foam agent is a silicone oil.

10. Method for reducing the propensity of fabrics to accumulate electrostatic charges which comprises treating the fabrics with an antistatic composition according to any one of Claims 3-9.

25 11. Method according to Claim 11, whereby the fabrics are treated with the antistatic composition during or after the rinse cycle of a wash process.

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