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PAPER WIPER

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This invention relates to an improved urea-formaldehyde wet-strength resin treated paper, more particularly this invention pertains to an improved urea-formaldehyde wet-strength resin treated paper containing a sulfamate salt, especially suitable as a wiper for glass surfaces such as windshield, window, etc.

In order to impart to a windshield glass surface the much-desired property of resisting dirt, grime, visibility-obstructing deposits, etc., methods of treating the wiper have been devised to incorporate varying amounts of diverse chemical additives which, upon rubbing, would give up a certain amount of the chemical spread thinly over the wiper surface. It has been known that paper impregnated with ammonium sulfamate improves the glass cleansing properties of the paper and if sufficient amounts of ammonium sulfamate are present, the paper is additionally fire retarding. When the quantity of ammonium sulfamate added to impart fire retardance is present, the paper's use as a wiper is dangerously impaired. This is due to the large amount of ammonium sulfamate transferred as a vision-hindering film. A film of ammonium sulfamate of undue thickness would give a condition similar to a grimy window during a clear day. Needless to say, this condition has limited the use of ammonium sulfamate in excessive amounts. However, the right amount of ammonium sulfamate in wet-strength paper has been hard to control besides being unpredictable.

Heretofore, it was not known why, upon storage, the cleansing property was lost. It has now been found that the problem existed because in wet-strength papers ammonium sulfamate decomposes to sulfate.

Prior art windshield wipers are usually made with formaldehyde base resins—the least expensive of the available wet-strength resins. This type of resin is necessary to prevent the disintegration of the wiper in use. Formaldehyde is introduced in a resin to crosslink the component parts of the resin such as urea, polyurea, melamine, etc. Unfortunately, such a resin slowly releases formaldehyde after it has been incorporated in the windshield wiper stock.

While it is not clear at this posture, it has been deduced from the present experiment that the presence of formaldehyde is responsible for the accelerated rate of hydrolysis of ammonium sulfamate. Decomposition of the ammonium sulfamate is, hence, rapid when the paper stock from which the windshield wiper has been made contains urea-formaldehyde, polyurea-formaldehyde or melamine-formaldehyde resins. Since the majority of paper used for windshield wiper production has been wet-strengthened with the above resins the use of ammonium sulfamate is for all practical purposes useless.

It has been found that the mono loweralkylammonium sulfamates hydrolyze in the same accelerated manner as ammonium sulfamate in the presence of formaldehyde to give rise to sulfate ions.

It has now been discovered that the shortcomings evident in the use of ammonium sulfamate as a cleansing improvement additive in wet-strengthened papers are eliminated when a secondary or tertiary loweralkylammonium or lower hydroxyalkylammonium sulfamate, or mixed lower alkyl, lowerhydroxyalkylammonium sulfamate is used as an additive. Compounds such as dimethyl and diethyl ammonium sulfamate, trimethyl and tri-

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ethyl ammonium sulfamate, diethanol- and triethanol ammonium sulfamate, dipropylammonium sulfamate, diisopropylammonium sulfamate, N-methylethanolammonium sulfamate, N,N-dimethylethanolammonium sulfamate, and the like are representative of the types of secondary and tertiary alkyl-ammonium sulfamates within the scope of the invention. The nitrogen(s) in the above compounds is basic. This property appears to be necessary for the herein enumerated compounds to give the needed results.

The use of cyclic secondary and tertiary amines, such as morpholines, piperazines and pyridines, in the preparation of secondary and tertiary alkylammonium sulfamates for use in paper also falls within the scope of this concept.

Since most alkylammonium sulfamates are not readily available, a solution of the desired secondary or tertiary alkylammonium sulfamate may be prepared conveniently by the addition of the stoichiometric amount of the precursor secondary or tertiary alkylamine to an aqueous solution of sulfamic acid.

In the practice of this invention, wet-strength resin containing paper stock suitable for windshield wiper or toweling use is impregnated by either spraying or by size-press application, or by any other standard coating application technique, with 0.001 to 0.05 pound moles of the above disclosed secondary or tertiary ammonium sulfamate for each 100 pounds of dry wet-strengthened paper stock.

Thus, the accomplished invention provides a wet-strengthened windshield wiper or towel which has superior cleaning properties on glass and is capable of imparting to the glass surface rubbed with said toweling a smooth, invisible, protective finish capable of retarding the resoiling process while imparting to the windshield glass surface the ability to rewet evenly and drain more completely with a significant reduction in the formation of vision hindering droplets and smears.

Following examples are illustrative and further describe this invention. These examples are not intended in any way to limit the broad scope of the invention.

Example 1

Freshly prepared paper towel stock consisting of bleached West Coast sulfite pulp weighing 35 lbs. per ream and containing about 1.5% (based on dry weight of the paper) of a urea-formaldehyde wet-strength resin was treated via a standard size press coating technique with an 0.15 molar solution of ammonium sulfamate. Nip pressure was so adjusted that the solution pickup was about equal to the weight of the paper. On a dry basis, this amounted to a treatment of about 0.015 gram mole of ammonium sulfamate for each 100 grams of dry paper.

Glass surfaces washed and wiped dry with this paper imparted to the surface a smooth, clear, protective finish which resisted resoiling better than a control which had been wiped with untreated paper toweling. However, after storage at normal room temperatures for a period of five months, the treated paper toweling had lost its cleansing properties and behaved no better than the untreated control. In addition, gravimetric sulfate analysis of the treated paper, which had been stored for five months, indicated that from 70–80% of the sulfamate added to the paper had been converted to sulfate.

Example 2

Freshly prepared towel stock as described in Example 1 was treated with an 0.15 molar solution of triethylammonium sulfamate so that the finished paper con-

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tained about 0.015 gram mole of triethylammonium sulfamate for each 100 grams of dry paper toweling.

An automobile windshield washed and wiped dry with this treated toweling had a smooth, clear, protective finish which resisted resoiling and rewetted more uniformly and with less beading than did the control. After a five months' storage period, the properties of the treated toweling were substantially the same as when first prepared with no more than a 5-8% conversion of sulfamate to sulfate noted.

Example 3

Freshly prepared paper towel stock as described in Example 1 was treated with an 0.15 molar solution of diethylammonium sulfamate so that the finished paper contained about 0.015 gram mole of diethylammonium sulfamate for each 100 grams of dry paper.

This toweling, used on glass, behaved exactly as the product described in Example 2 and, after a five-month storage period at room temperature, sulfate analysis indicated that no more than 7-10% of the sulfamate present originally had been converted to sulfate.

Example 4

Freshly prepared paper towel stock as described in Example 1 was treated with a 0.15 molar solution of monoethylammonium sulfamate so that the finished paper toweling contained about 0.015 gram mole of monoethylammonium sulfamate for each 100 grams of dry paper.

This paper toweling, after a five-month storage period, showed that about 80% of the sulfamate had been converted to sulfate, and the desired properties were no longer demonstrable even though they were initially present in the treated paper toweling.

What is claimed is:

1. A paper sheet which has been wet-strengthened with a formaldehyde base wet-strength resin and which comprises a minor amount of at least one sulfamate compound selected from the class consisting of dialkyl ammonium sulfamates, trialkyl ammonium sulfamates, di(hydroxyalkyl) ammonium sulfamates, tri(hydroxyalkyl) ammonium sulfamates, alkyl(hydroxyalkyl) ammonium sulfamates, dialkyl(hydroxyalkyl) ammonium sulfamates and di(hydroxyalkyl) alkyl ammonium sul-

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famates wherein the alkyl groups or hydroxyalkyl groups are groups which contain 1 to 4 carbon atoms.

2. A paper sheet as claimed in claim 1 wherein the formaldehyde base wet-strength resin used to improve the wet-strength of said sheet is selected from at least one member of the group consisting of urea-formaldehyde resins, polyurea-formaldehyde resins and melamine-formaldehyde resins.

3. The paper sheet according to claim 1 wherein the sulfamate compound is a dialkyl ammonium sulfamate wherein each of the alkyl groups contains from 1 to 4 carbon atoms.

4. The paper sheet according to claim 1 wherein the sulfamate compound is trialkyl ammonium sulfamate wherein each of the alkyl groups contains from 1 to 4 carbon atoms.

5. The paper sheet according to claim 1 wherein the sulfamate compound is tri(hydroxyalkyl)ammonium sulfamate wherein each of the hydroxyalkyl groups contains from 1 to 4 carbon atoms.

6. The paper sheet according to claim 1 wherein the sulfamate compound is di(hydroxyalkyl)ammonium sulfamate wherein each of the hydroxyalkyl groups contains from 1 to 4 carbon atoms.

7. A paper wiper for motor vehicle windshields comprising a major amount of waterlaid paper stock wet-strengthened by means of a minor amount of formaldehyde base wet-strength resin, said paper wiper being modified by incorporating a minor amount of the degradation resistant cleansing film forming dialkyl ammonium sulfamate compound wherein each of the alkyl groups contains from 1 to 4 carbon atoms.

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