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PASTE ROSIN SIZE CONTAINING FORTIFYING AGENT

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ABSTRACT OF THE DISCLOSURE

It has been discovered that the effectiveness of paste rosin size as an agent which renders paper water-resistant is greatly increased when the size has a dissolved content, up to 15% of the solids thereof, of a phosphate salt. The phosphate salt thus acts as fortifying agent for the size.

The present invention relates to paste rosin size of improved sizing properties process for the manufacture thereof, and to paper sized therewith.

Paste rosin size is the most widely used agent for the manufacture of sized paper and consists essentially of a rosin which has been saponified with an aqueous alkali metal alkali solution. The amounts of water and of alkali used for the saponification are predetermined so that the product contains 60%–80% by weight of rosin size solids and 5%–25% of rosin acids based on the weight of the rosin solids (cf. U.S. Patent No. 2,873,203).

Among the rosins used for the manufacture of this size are gum rosin, wood rosin, and tall oil rosin (and mixtures thereof) as well as the "fortified" rosins prepared by reacting the aforementioned rosins with a small amount of formaldehyde, saligenin, maleic anhydride, fumaric acid, acetylenedicarboxylic acid, etc.

The term "fortifying" means that the added component increases the effectiveness of the size as an agent which renders cellulose fibers water-resistant when applied thereto in aqeous suspension by the action of alum.

The discovery has now been made that paste rosin size is "fortified" (i.e., it is increased in its efficiency as a size) by the presence of a small dissolved amount of an alkali- and acid-soluble phosphate salt. The improvement achieved is substantial, and in preferred instances has been as high as 45%.

The amount of phosphate salt present in the sizes of the present invention depends upon the amount of improvement desired. The greatest benefit per increment of phosphate salt added takes place when the weight of the salt is less than 2% of the weight of the size solids. The benefit continues at a decreasing rate until the saturation point is reached.

The aqueous phase of paste rosin size is not large (20% to 40% of the total weight of the size) and this phase is composed of water and is saturated with alkali metal ions, rosinate ions (or micelles), etc. As a result, this phase does not dissolve more than perhaps 25% of its weight of phosphate salts, so that the maximum amount of phosphate salt present even in the case of 60% solids size is roughly 10% of the weight of the size as a whole (roughly 15% on the weight of the size solids). In most instances we prefer to keep well below the saturation level so as to avoid formation of crystals of phosphate in the size.

Very satisfactory results have been obtained from monosodium orthophosphate, disodium orthophosphate, trisodium orthophosphate, sodium tripolyphosphate, tetrasodium pyrophosphate tri[tri(2 - hydroxyethylamine)] phosphate, magnesium acid orthophosphate, and sodium

monoethylphosphate; the corresponding potassium salts of the foregoing; and the salts of the several phosphoric acids with soluble non-volatile amines, for example morpholine. Mixtures of these salts can be used. These salts are soluble to the extent of at least 10% in water at 150° F.

The phosphate salts can be added at any convenient point in the manufacture of the size, for example, by dissolving the phosphate salt in the water (which usually has a temperature in excess of 150° F.) which is used for the manufacture of the rosin size. If preferred, the phosphate salt or salts can be added to paste rosin size either dissolved in a little water or in dry particulate state. Since rosin size is strongly alkaline, the addition of phosphoric acid is equivalent to the addition of the corresponding alkali metal phosphate.

The phosphates may be salts of a phosphoric acid with sodium, magnesium or other solubilizing cations. Best results have been achieved with potassium and with non-volatile water-soluble amines and these are therefore preferred.

The size compositions of the present invention may contain such other materials as have heretofore been present in rosin size, for example, sodium chloride, nitrate or acetate, or isopropyl alcohol to decrease the viscosity of the size; mold growth inhibitors; formaldehyde and wax size and "fortified" rosin (rosin which has been reacted with e.g., maleic anhydride, fumaric acid, formaldehyde, citric acid and, saligenin to improve its efficiency).

The invention is further illustrated by the examples which follow. These examples are preferred embodiments, and the invention should not be regarded as limited thereto.

Example 1

The following illustrates the preparation of paste rosin sizes having a content of disodium phosphate as fortifying agent.

The sizes are prepared by saponification of a non-crystallizing tall oil rosin with sufficient aqueous sodium hydroxide to form a paste rosin size containing 77% solids by weight and 15% free rosin acids. The aqueous sodium hydroxide has a dissolved content of disodium phosphate as shown in the table below.

The efficiencies of the resulting paste sizes are determined by standard laboratory procedure, which comprises forming an aqueous suspension of well-beaten bleached kraft paper-making pulp at 0.6% consistency in deionized water, adding in each instance 1% of the size under test and 1½% of alum, forming the suspension into handsheets at 50 lb. basis weight, drying the handsheets for 90 seconds on a laboratory drum drier having a drum temperature of 240° F., and determining the resistance of the resulting paper to penetration by TAPPI standard ink (T–431 TS–64). The procedure is repeated using as control a sample of the same rosin which contains no phosphate.

Results are as follows.

Run No.	Phosphate salt present		Sizing	
	Formula	Percent [1]	Seconds	Percent increase
Control	None		566	
1	NaH_2PO_4	0.5	694	22.6
2	NaH_2PO_4	2.0	728	28.6
3	NaH_2PO_4	8.0	823	45.3

[1] Based on the weight of the size solids.

Example 2

The procedure of run 1 is repeated on another occasion using a different batch of pulp and different phosphates.

Results are as follows.

Run No.	Phosphate salt present		Sizing	
	Name	Percent [1]	Seconds	Percent increase
	None (control)		600	
1	Na tri-polyphosphate	1	649	8.3
2	K tri-polyphosphate	1	698	16.6
3	Na hexametaphosphate	1	672	11.0
4	Tetrasodium pyrophosphate.	1	700	16.7
5	Tri[tri-(2-hydroxyethyl) amine]phosphate.	1	781	30.0

[1] Based on the weight of size solids.

We claim:

1. In the manufacture of paste rosin size wherein a rosin is saponified with aqueous alkali metal alkali solution to form paste rosin size containing 60%–80% by weight of rosin size solids and 5%–25% of rosin acids based on the weight of the rosin solids therein, the improvement which consists in adding during said manufacture in an amount ranging between that which is sufficient to fortify the size and 15% based on the weight of size solids, of a phosphate salt soluble in paste rosin size as fortifying agent for said size.

2. A process according to claim 1 wherein the alkali metal alkali solution is sodium hydroxide solution and the phoshpate salt is added to said solution.

3. Paste rosin size made according to the method of claim 1.

4. Size according to claim 3 wherein the phosphate salt is a metaphosphate.

5. Size according to claim 3 wherein the phosphate salt is an orthophosphate.

6. Size according to claim 3 wherein the salt is a pyrophosphate.

7. Size according to claim 3 wherein the salt is a potassium salt.

8. Size according to claim 3 wherein the phosphate is a salt of a phosphoric acid with a non-volatile water-soluble amine.

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