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(54) Title: FLAME-RETARDANT COMPOSITION AND USE (57) Abstract The invention relates to a flame-retardant preparation which contains at least an organic nitrogen compound which contains as functional group(s) one or more $OC = NH_{(y)}$ groups, $CH_{(x)} - NH_{(y)}$ groups and/or $= C - NH_{(y)}$ groups, the symbols y independently of one another having a value of 0, 1, 2 or 3 and x having a value of 1, 2 or 3, for example urea or melamine, diammonium hydrogen phosphate and/or ammonium dihydrogen phosphate; and an ammonium halide. Preparations of this type are advantageously used to render combustible materials such as textiles and wood products flame-retardant. Moreover, these preparations, especially in concentrated form, can act as extinguishing water.		

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Flame-retardant composition, and use.

5 The invention relates to a flame-retardant preparation which contains ammonium phosphate and one or more nitrogen compounds liberating ammonia on decomposition.

A preparation of this type is disclosed in US Patent 3,398,019. More particularly, this US Patent relates to the treatment of wood fibre products with an aqueous solution of a flame-retardant preparation which contains ammonium phosphate and in which a decomposition inhibitor for the ammonium phosphate is also incorporated. A decomposition inhibitor of this type is defined as a nitrogen compound which must decompose below the decomposition temperature of the ammonium phosphate (i.e. monoammonium phosphate or diammonium phosphate) with the liberation of ammonia. Both inorganic nitrogen compounds, such as water-soluble ammonium salts, for example the ammonium halides, ammonium carbonate and ammonium sulphide, and organic nitrogen compounds, such as amides and amidines, for example urea, formamide, acetamide and guanine, are mentioned as examples of such decomposition inhibitors. The aim of the invention described in this US Patent 3,398,019 lies in the prevention or substantial minimilization of the undesired discoloration of wood fibre products impregnated with the aqueous ammonium phosphate solution during the drying process for said products, which process is carried out above the decomposition temperature of ammonium phosphate.

Differing from the abovementioned US Patent 3,398,019, the aim of the invention is to develop a flame-retardant preparation which is both particularly effective and can be applied in a simple manner to, or in some cases in, the materials to be protected. There is still a great need for a flame-retardant preparation of this type since the fire hazard which is associated with the use of many combustible materials, such as textile materials, is appreciable and must in no way be underestimated.

35 It has been found that the aim indicated above can be achieved if the preparation contains at least

- an organic nitrogen compound which contains as functional

group(s) one or more $\text{O}=\text{C}-\text{NH}_{(y)}$ groups, $\text{CH}_{(x)}-\text{NH}_{(y)}$ groups and/or $=\text{C}-\text{NH}_{(y)}$ groups, the symbols y independently of one another having a value of 0, 1, 2 or 3 and x having a value of 1, 2 or 3,

- 5 - diammonium hydrogen phosphate and/or ammonium dihydrogen phosphate; and
 - an ammonium halide.

In connection with the above definition of the organic nitrogen compound it is emphasized that the presence of a $\text{O}=\text{C}$, $\text{CH}_{(x)}$ and/or $=\text{C}$ group in the α -position relative to the nitrogen atom is essential since, surprisingly, it has been found that, at high flame temperatures, compounds containing these types of groups can form radicals which have a long life and are able to react with oxygen. As a consequence, the extinguishing action of an ammonium phosphate-containing preparation according to the invention, the ammonium phosphate of which itself already has a flame-retardant action, is promoted. Examples of such nitrogen compounds are urea, dimethylurea, melamine, glycine, guanidine, guanylurea, acetamidine and formamide, of which melamine and, for reasons of cost and availability, especially urea are to be preferred.

When used on cellulose fibres, the more intensive flame-retardant action of the preparations according to the invention can, moreover, be ascribed in particular to the formation of phosphoric acid and phosphoric acid amides at elevated temperature, for example about 300°C , this being termed the phosphorus-nitrogen synergism within the framework of the invention. At this temperature and under these conditions an accelerated dehydration of cellulose is obtained. During this dehydration the hydrogen is withdrawn from the cellulose molecule so that no compounds presenting a fire hazard are able to form. The dehydration mechanism presumably proceeds via an acid protonation of a hydroxyl group of the cellulose molecule. After the elimination of water, which yields an intermediate carbocation, a fairly non-hazardous elimination product of the type $>\text{C}=\text{C}<$ and a proton form. With this form of flame retardation it is essential that this mechanism takes place at higher temperatures, while the preparation according to the invention is neutral at lower temperature, such as during the

application thereof.

With regard to the third component of the preparation according to the invention, that is to say an ammonium halide such as ammonium chloride, ammonium bromide and ammonium fluoride, it is emphasized that ammonium halides generally decompose into ammonia and the hydrogen halide gas at elevated temperature. These gases are diluted with the pyrolysis products of the material which has been treated with the preparation according to the invention and may itself be regarded as flame-retardant. Moreover, in the presence of phosphorus compounds, compounds of this type display a synergistic effect with respect to the flame retardancy. This effect, which within the framework of the invention is termed phosphorus-halogen synergism, can be explained by the formation of non-combustible phosphorus oxyhalides, which are able to react with the pyrolysis products of the treated material.

As can be derived from the above, the eminent fire-retardant action of the preparations according to the invention is based on a combination of synergistic effects. On the basis of this it can even be proposed that relatively less active substance is needed to obtain a specific degree of flame-retardancy than would be needed with the separate active (= flame-retardant) materials. In this context it is pointed out that, for example, urea as such has no flame-retardant action but produces the synergistic effect described above only in the presence of phosphates, that is to say the action of the mixture of phosphates and urea is greater than that of the separate components themselves.

To return to the US Patent 3,398,019 discussed above, it can be stated that the specific combination of the three types of substance of the preparations according to the invention is in no way used in said patent; in other words, the eminent action of the preparations according to the invention based on the combination of the synergistic effects indicated above is in no way recognized in said US patent. To support this statement, reference is made to the claims of said US patent, in which only the combination of two types of substance of the preparations according to the invention, that is to say ammonium phosphate and an ammonium halide, is mentioned. The Applicant is therefore of the opinion that the

invention must be regarded at least as an invention of choice with regard to the broad content of US Patent 3,398,019.

The invention relates in particular to flame-retardant preparations which contain

- 5 - urea and/or melamine, preferably urea, as the organic nitrogen compound;
- a mixture of diammonium hydrogen phosphate and ammonium dihydrogen phosphate; and
- 10 - ammonium chloride and/or ammonium bromide, preferably ammonium chloride, as the ammonium halide.

The respective amounts of the three components preferably used in the preparations according to the invention are advantageously

- 2-5 parts by weight, preferably 3.5-5 parts by weight, of urea;
- 15 - 7.5-20 parts by weight, preferably 10-15 parts by weight, of diammonium hydrogen phosphate/ammonium dihydrogen phosphate, and
- 0.25-0.75 part by weight, preferably 0.3-0.5 part by weight, of ammonium chloride.

For applying the flame-retardant preparation according to the invention to products to be rendered flame-retardant, the above-mentioned three types of components are advantageously dissolved in an effective amount in water; the pH of such a solution is in the range 6-8. More particularly, the three types of components are dissolved in the amounts indicated above in x. 100 parts by weight

25 of water, x having a value in the range 0.25-5.

Since some of the abovementioned three types of components can also be formed in situ when making up a water-containing preparation according to the invention, it is possible in the case of a preparation built up from urea, diammonium hydrogen phosphate/ammonium dihydrogen phosphate and ammonium chloride to

30 use, in addition to urea, suitable amounts of ammonia, hydrogen chloride and phosphoric acid. Preferably, the three lastmentioned reagents are used in the form of an aqueous solution, such as ammonia (25 % solution), hydrochloric acid (30 % solution) and

35 phosphoric acid (85 % solution). In view of the fact that some of the ammonia is lost by evaporation as a result of the heat of reaction generated, an appreciable proportion of the required

amount of diammonium hydrogen phosphate is added in the form of this compound. By this means, the undesired loss of ammonia is reduced, which leads to an appreciable saving in the required amount of ammonia.

5 There are numerous advantages associated with the preparation according to the invention. Firstly it is pointed out that the preparation in question is made up of substances which are non-toxic or are of very low toxicity, so that there can hardly be objection to the use thereof from the environmental standpoint.

10 Moreover, the preparation in question, as a solution in water, has a neutral pH, that is to say a pH in a range of 6-8, and can therefore be regarded as non-irritant for the skin. Tests carried out in accordance with OECD guidelines with a preparation made up of urea, diammonium hydrogen phosphate/ammonium dihydrogen phosphate and

15 ammonium chloride have shown that a preparation of this type is not irritant for the skin and eyes and is even considered non-toxic when taken orally (in small amounts). To increase the adhesion between the active constituents of the flame-retardant preparation according to the invention and the materials or surfaces thereof to

20 be treated, such as textile (fibres) and wood (fibres), an effective amount of glycerol can be added to the preparations in question. The amount of glycerol, to which there likewise can hardly be objection from the environmental standpoint, to be used in the preparation according to the invention is, for example,

25 0.5-1.5 parts by weight, preferably 0.7-1.0 part by weight, relative to the ranges indicated above with regard to the amounts of the components to be used. Furthermore, when used on textile fibres and/or wood fibres, the preparation can be provided with a water-repellent agent so that the treated fibres acquire a certain

30 degree of water repellency and/or fastness to washing. As an example of an agent of this type, the product "HYDROB FC" (Caldic Belgium N.V., Hemiksen, Belgium) can be used in an amount of, for example, 3-5 % by weight, calculated relative to the material to be treated. For this product, the manufacturer indicates that on

35 heating the materials treated herewith to, for example, 120°C or even 180°C the effect achieved, such as water repellency, is fast to washing.

The preparation of the flame-retardant preparations according to the invention can take place by simple mixing of the components in a mixing vessel provided with a stirrer device. In view of the reactivity of the products which may be used as starting materials, such as the abovementioned concentrated hydrochloric acid and concentrated phosphoric acid, the mixing vessel and the auxiliary apparatus belonging thereto are made of corrosion-resistant material, such as stainless steel. The said components can be used as such, but usually are advantageously used as a solution in water. Specifically, hydrogen chloride, phosphoric acid and ammonia are used as solutions, which may be concentrated, in water. For this reason, concentrated hydrochloric acid (for example 30 % w/w), concentrated phosphoric acid (for example 85 % w/w) and ammonia (for example 25 % w/w) are advantageously used in a practical embodiment of the production of specific preparations according to the invention. The mixing of the components usually takes place in a closed vessel.

The water-containing flame-resistant preparations according to the invention usually contain 10-20 % by weight, advantageously 13-15 % by weight, of active substances. However, the preparations according to the invention can also exist in concentrated form, for example in connection with transport and for certain applications. Examples of such applications are the production processes for paper and cardboard, the end products of which must have a low final moisture content. In the latex industry also it is considered desirable to work with concentrated solutions as far as possible.

The flame-retardant preparations according to the invention can, as has already been stated in part, be used for many materials, such as textiles, paper, cardboard, wood and products derived therefrom, and waterbased paint and also as extinguishing material.

More particularly, diverse textile materials, such as cotton, cotton/polyester material preferably containing at least 50 % cotton (is used as curtain material), wool, wool/cotton woven fabrics, wool/viscose woven fabrics, such as, for example, 70/30 wool/viscose woven fabric, which is used as upholstery material, and also other textile materials may be mentioned. In order to

render the textile materials flame-retardant it already suffices to moisten these once completely with the water-containing preparation according to the invention by, for example, immersion or spraying with an atomizer device. In this context it is important that any
5 finishes which may be present on the textile material are removed from the textile material beforehand. After moistening the textile material with the aqueous preparation according to the invention, this textile material may be force-dried if appropriate. The flame retardancy of the textile materials treated in this way, which are
10 used, inter alia, as curtain or upholstery materials, is considered to be appreciable. Even on dry cleaning (that is to say cleaning without H₂O), the flame retardancy of the treated materials is virtually completely retained.

It is also possible to impart flame-retardant characteristics
15 to diverse types of paper and cardboard using the preparations according to the invention. For this purpose the paper or cardboard is completely moistened by means of, for example, immersion or spraying, after which the material is dried.

Wood, such as deal, and products derived from wood, such as
20 Triplex and chipboard, can also be rendered flame-resistant using a preparation according to the invention. Apart from by spraying or immersion, the preparation can be applied to porous wood materials, such as chipboard and the like, using a brush, while the generally known vacuum treatment is preferred for types of wood such as deal.

25 Following on from the above, the preparations according to the invention can be added to water-based paints, such as latex paints, which are then applied to, for example, sheet materials. After applying a latex paint having a composition of this type, and drying, a surface is obtained which is both fire-resistant and
30 aesthetically pleasing.

Finally, the preparations according to the invention can be
used as such in the form of an extinguishing agent for fighting
fires which are usually fought with water, such as in dwellings,
wood fires and the like. In the preparation according to the
35 invention which is used as an extinguishing agent the relative amounts of the components are advantageously

- 5-15 parts by weight, preferably 7.5-12.5 parts by weight, of

urea or a similar compound;

- 15-40 parts by weight, preferably 20-30 parts by weight, of a mixture of diammonium hydrogen phosphate and ammonium dihydrogen phosphate; and
- 5 - 0.5-1.5 parts by weight, preferably 0.6-1.0 part by weight, of ammonium chloride.

The content of active substances in the extinguishing water is advantageously very appreciable, for example in the range 20-60 % by weight, preferably 30-50 % by weight. As a result of the particularly high extinguishing power of extinguishing water of this type, there is a possibility of substantially restricting the water damage, which always occurs when extinguishing a fire in a dwelling or the like. The multi-purpose nature of the extinguishing water indicated above can, moreover, be broadened if a foam-forming agent, such as a suitable detergent, is also used in the extinguishing water, in a concentration of, for example, 1-10 % by weight calculated relative to the total composition of the extinguishing water. This lastmentioned additive renders the said extinguishing water suitable for so-called A-type fires (wood and paper fires) and B-type fires (liquid fires). A suitable foam-forming agent is the commercially available product "HCA Polar Newtonian" (a fluorocarbon compound) (Uniser, Amplepuis, France).

To summarize, it can be stated that the flameretardant preparations according to the invention can be used in diverse fields and for this reason constitute a particularly attractive product from the industrial standpoint.

The invention is illustrated in more detail with the aid of the examples below; these examples must not be taken as restrictive.

30 Example I

3000 litres of water were fed into a stainless steel mixing vessel which has a capacity of 3800 litres and is provided with a stirrer device. The following were then added independently of one another via separate storage vessels:

- 35 - 90 kg of urea
- 195 kg of diammonium hydrogen phosphate
- 45 kg of ammonia (200 litres of 25 % by weight ammonia)

- 24 kg of 30 % by weight hydrochloric acid (21 litres), and
- 150 kg of 85 % by weight phosphoric acid (102 litres).

The amount of active constituents was 504 kg per 3000 litres or 16.8 % by weight of active substances per unit volume of preparation. The pH of the flame-retardant preparation obtained was about 7.0-7.3.

Example II

3000 litres of water were fed into a stainless steel mixing vessel which has a capacity of 3800 litres and is provided with a stirrer device. The following are then added independently of one another via separate storage vessels

- 90 kg of urea
- 90 kg of ammonia (400 litres of 25 % by weight ammonia)
- 24 kg of 30 % by weight hydrochloric acid (21 litres), and
- 300 kg of 85 % by weight phosphoric acid (204 litres).

The amount of active substances in this case also was 504 kg per 3000 litres or 16.8 % by weight per unit volume of preparation. The pH of the flame-retardant agent was likewise between 7.0 and 7.3.

Example III

The procedure described in Example I was followed, except that 30 kg of glycerol were also added. A flame-retardant preparation with improved adhesion characteristics was obtained.

Example IV

The procedure described in Example II was followed, except that 30 kg of glycerol were also added. In accordance with this example also, a water-containing preparation was obtained which had improved adhesion characteristics with respect to the materials to be treated.

Example V

In this example the results are given of a study which was carried out to determine the effectiveness of a treatment with the preparation of Example I on the burning characteristics of textile materials of diverse composition on heating briefly with a small heat source. In this study tests were also carried out to determine whether the fire-retardant action of the product was influenced when the treated materials had undergone dry cleaning without the use of water.

- Twelve textile materials, which are listed in Table A below, were included in the study. Before treating the materials with the preparation of Example 1, these materials were washed in a washing machine with a conventional detergent in order to remove any finishes which may be present and were then dried in a drying oven or stored over silica gel in a desiccator. The pretreated materials were immersed in the water-containing preparation of Example I and then centrifuged and dried. Some of the treated samples of all materials were then dry cleaned once (without the use of water).
- All textile materials were then subjected to an exploratory examination in accordance with NEN Standard 1722 "Brandgedrag van textiel; bepaling van het al dan niet gemakkelijk ontvlambaar zijn en de verticale vlamsnelheid van verticaal toegepast textiel" ("Burning characteristics of textiles; determination of whether or not the material is readily inflammable and of the vertical flame speed of textiles used vertically") of October 1981 (2nd impression). Samples of each type of textile were subjected to the following tests:
- a) after single clamping, the untreated textile material was tested by applying a flame for a contact time of 5 sec. Because all materials burned away fairly rapidly, a test with a contact time of 15 sec was no longer carried out;
 - b) the materials treated with the preparation in Example I and the materials dry cleaned once were tested using a contact time of 5 and 15 sec;
 - c) to simulate curtain pleating, the curtain materials 1 to 9 inclusive, listed in Table A, were also tested in three layers behind one another. The test pieces were always ignited at the edge (Section 6.3.2 of NEN 1722).
- The test results are given in Table A below. In addition to the textile composition, the times taken for the three cotton measuring threads to burn through in the tests according to NEN 1722 are noted in this table.
- The symbol - which occurs in Table A indicates that the flame front did not reach the measuring thread.

TABLE A

Material data		Contact time with flame [sec]	Time taken for cotton measuring thread to burn through, measured from [sec] first contact with flame									
No.	Composition	Mass/surface area (untreated) [kg/m ²]	Untreated samples			Treated with preparation of Example I						
						Dry cleaned once			1 3 layer layers			
			1	2	3	1	2	3	1	2	3	
1	100% wool mousseline	0.115	11	16	20	-	-	-	-	-	-	-
2	100% wool	0.245	10	20	25	-	-	-	-	-	-	-
3	100% cotton jersey	0.140	7	10	13	-	-	-	-	-	-	-
4 ¹⁾	100% cotton flannel	0.140	8	12	14	-	-	-	-	-	-	-
5	100% cotton jeans	0.225	13	19	22	-	-	-	-	-	-	-

(continuation of Table A)

6	100% cotton towel	0.290	5 15	15	19	25	-	-	-	-
7 ¹⁾	85% cotton 15% polyester cord	0.325	5 15	10	15	22	-	-	-	-
8	35% cotton 65% polyester	0.100	5 15	7	12	14	-	-	-	-
9	50% cotton 50% modacryl	0.115	5 15	8	11	14	-	-	-	-
10 ²⁾	100% wool mohair	0.260	5 15	30	45	54	-	-	-	-
11 ²⁾	100% cotton denim	0.315	5 15	20	25	32	-	-	-	-
12 ²⁾	70% wool 30% viscose	0.630	5 15	18	25	30	-	-	-	-
1) curtain materials; also tested in three layers										
2) upholstery materials										

As can be seen from the results given in Table A, in the untreated state all textile materials tested burn away fairly rapidly. In an assessment as curtain material or material under tension in accordance with the appendix to NEN 1722 and after a complete test in accordance with this specification, they would in all probability be designated "readily flammable". Moreover, it can be deduced from this Table A that the treatment with the flame-retardant preparation of Example I had a favourable to highly favourable influence on the burning characteristics of all textile materials tested. The textile materials treated with the preparation according to the invention did not continue to burn after the flame used for ignition was removed. In a complete test in accordance with the Standard, these materials will therefore very probably be designated "not readily flammable" according to the appendix to NEN 1722.

All of the textile materials still showed no continuation of burning after a dry cleaning step had been carried out once. The burning characteristics of the curtain materials treated with the preparation of Example I was not found to be less favourable in pleats (tested by clamping three layers behind one another) than on the material stretched flat; the same applies after one dry cleaning step.

To summarize, it can be stated that the preparation according to the invention which has been used has a favourable influence on the burning characteristics of textile materials which are made up for the greater part from natural fibres.

Example VI

In this example the results are given of a study which was carried out to determine the effectiveness of a treatment with the preparation of Example I on the burning characteristics of samples of deal in accordance with NEN 3883.

Samples with dimensions of 290 x 1000 mm and 290 x 290 mm respectively and a thickness of 18 mm were used in the study. The samples were treated in two ways, that is to say:

- a) immersing some of the deal samples for 5 min in the preparation according to Example I, and
- b) impregnating the other deal samples in a boiler (1 hour vacuum/2 hours under a pressure of 8 bar with the preparation according to Example I).

The amounts taken up with methods (a) and (b) are listed in Tables B and C below. The amounts of preparation taken up are given in g and as g/m^2 and as kg/m^3 .

TABLE B

No.	Untreated wt. (g)	Liquid taken up after immersion		
		(g)	kg/m^3	g/m^2
1	2325.9	68.5	13.1	118.1
2	2336.1	69.2	13.3	119.3
3	657.5	32.1	21.2	190.8
4	713.7	31.8	21.0	189.1
5	718.6	31.4	20.7	186.7
6	705.0	30.1	19.9	179.0
7	708.2	30.1	19.9	179.0
8	691.9	31.8	21.0	189.1
Average		40.6	18.8	168.9

TABLE C

No.	Untreated wt. (g)	Liquid taken up on vacuum/pressure treatment		
		(g)	kg/m^3	g/m^2
1	2305.9	2075.7	397.6	3578.8
2	2284.1	2131.1	408.3	3674.3
3	638.0	606.4	400.5	3605.2
4	644.7	555.4	366.8	3302.0
5	640.4	491.6	324.7	2922.7
6	643.6	511.6	337.9	3041.6
7	710.9	851.9	562.7	5064.8
8	684.8	433.5	286.3	2577.3
Average		957.1	385.6	3470.8

No. 1-2 dimensions 290 x 1000 x 18 mm
 Others dimensions 290 x 290 x 18 mm

Tests in respect of the flame propagation and flame flash-over were carried out in accordance with NEN 3883 using the samples treated in the above manner and using untreated samples. The samples were assigned to the relevant class category on the basis of the results obtained.

TABLE D

Material	Treatment	Flame propagation (FP) [mm] during		Contribution to flame flash-over (FFO)		Class category		
		the first 1½ min	10 min	energy supplied [W]	FFO time [min]	FP	FFO	NEN 3883
deal	untreated	400	>1000	750	5 3/4	4	3 or 4	4
	immersed	280	530	750	14½	3	3	3
	vacuum/ pressure		0	750 1500	27½ 8	1	2	2

* [W] = Watt

It follows from the results given in Table D above that the treatment with the preparation according to the invention leads to an appreciable improvement in the fire retardancy of the deal. The treatment of deal using the vacuum/pressure method even led to an improvement from NEN 3883 Class 4 (untreated deal) to NEN 3883 Class 2.

CLAIMS

1. Flame-retardant preparation which contains ammonium phosphate and one or more nitrogen compounds liberating ammonia on decomposition, characterized in that the preparation contains at least
- 5 - an organic nitrogen compound which contains as functional group(s) one or more $O=C-NH_{(y)}$ groups, $CH_{(x)}-NH_{(y)}$ groups and/or $=C-NH_{(y)}$ groups, the symbols y independently of one another having a value of 0, 1, 2 or 3 and x having a value of 1, 2 or 3,
- 10 - diammonium hydrogen phosphate and/or ammonium dihydrogen phosphate; and
- an ammonium halide.
2. Flame-retardant preparation according to Claim 1, characterized in that the preparation contains
- 15 - urea and/or melamine as the organic nitrogen compound;
- a mixture of diammonium hydrogen phosphate and ammonium dihydrogen phosphate; and
- ammonium chloride and/or ammonium bromide as the ammonium halide.
3. Flame-retardant preparation according to Claim 1 or 2, characterized in that the preparation contains at least the
- 20 components urea, diammonium hydrogen phosphate/ammonium dihydrogen phosphate and ammonium chloride.
4. Flame-retardant preparation according to Claim 3, characterized in that the preparation contains the components urea,
- 25 diammonium hydrogen phosphate/ammonium dihydrogen phosphate and ammonium chloride in relative amounts of
- 2-5 parts by weight of urea
- 7.5-20 parts by weight of (di)ammonium (di)hydrogen phosphate, and
- 30 - 0.25-0.75 part by weight of ammonium chloride.
5. Flame-retardant preparation according to Claim 4, characterized in that the preparation contains the components urea, diammonium hydrogen phosphate/ammonium dihydrogen phosphate and ammonium chloride in relative amounts of
- 35 - 2.5-3.5 parts by weight of urea
- 10-15 parts by weight of (di)ammonium (di)hydrogen phosphate, and
- 0.3-0.5 part by weight of ammonium chloride.

6. Flame-retardant preparation according to one or more of Claims 1-5, characterized in that the preparation is dissolved in an effective amount in water, the pH of the water-containing preparation lying in the range 6-8.
- 5 7. Flame-retardant preparation according to Claims 4 and 6, characterized in that the preparation is dissolved in x. 100 parts by weight of water, x having a value in the range 0.25-5.
8. Flame-retardant preparation according to Claims 5 and 6, characterized in that the preparation is dissolved in x. 100 parts
10 by weight of water, x having a value in the range 0.25-5.
9. Flame-retardant preparation according to one or more of Claims 1-8, characterized in that the preparation also contains glycerol.
10. Flame-retardant preparation according to Claim 9,
15 characterized in that the preparation also contains 0.5-1.5 parts by weight of glycerol.
11. Flame-retardant preparation according to Claim 10, characterized in that the preparation also contains 0.7-1.0 part by weight of glycerol.
- 20 12. Method for rendering products flame-retardant, characterized in that a flame-retardant preparation according to one or more of Claims 1-11 is applied to the product to be protected and this treated product is dried.
13. Product rendered flame-retardant and obtained in
25 accordance with the method according to Claim 12.
14. Water-based paint, characterized in that this paint contains an effective content of the flame-retardant preparation according to one or more of Claims 1-11.
15. Extinguishing agent, characterized in that this
30 extinguishing agent contains an effective content of the flame-retardant preparation according to one or more of Claims 1-11.

16. Extinguishing agent according to Claim 15, characterized in that the extinguishing agent is a 20-60 % by weight solution in water of active constituents in relative amounts of

- 5-15 parts by weight of urea;
- 5 - 15-40 parts by weight of (di)ammonium (di)hydrogen phosphate, and
- 0.5-1.5 parts by weight of ammonium chloride.

17. Extinguishing agent according to Claim 16, characterized in that the extinguishing agent is a 30-50 % by weight solution in water of active constituents in relative amounts of

- 10 - 7.5-12.5 parts by weight of urea;
- 20-30 parts by weight of (di)ammonium (di)hydrogen phosphate; and
- 0.6-1.0 part by weight of ammonium chloride.

18. Extinguishing agent according to one or more of Claims 15-17, characterized in that the extinguishing agent also
15 contains a foam-forming gent.
