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HR, HU, ID, IL, IN, IS, JP, KE, KG, KM, KN, KP, KR, KZ, LA, LC, LK, LR, LS, LT, LU, LY, MA, MD, ME, MG, MK, MN, MW, MX, MY, MZ, NA, NG, NI, NO, NZ, OM, PE, PG, PH, PL, PT, QA, RO, RS, RU, RW, SC, SD, SE, SG, SK, SL, SM, ST, SV, SY, TH, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, ZA, ZM, ZW.

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- as to the identity of the inventor (Rule 4.17(i))
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(54) Title: FIRE-RESISTANT COATING MATERIAL ADINA

(57) Abstract: Title of the Invention: Fire-resistant Coating Material ADINA Fire-resistant coating material ADINA comprising ammonium polyphosphate in the amount of 5 to 50 % w/w, pentaerythritol in the amount of 6 to 33 % w/w, melamine in the amount of 4 to 22 % w/w, binder based on polyvinylacrylate dispersion in the amount of 0 to 16,3 % w/w, plasticizer based on diisononylphthalate in the amount of 2,3 to 3,5 % w/w, talc in the amount of 3 to 10 % w/w, stabilizer (preservative) based on 4-chloro-3-methylphenol in the amount of 0,15 to 0,25 % w/w, and water in the amount of 3,5 to 17 % w/w.



Fire-resistant coating material ADINA

### Field of the Invention

The invention relates to coating materials for technical purposes, especially fire-resistant coating materials ADINA.

### Background of the Invention

Fire-resistant coating materials for technical purposes are well-known and widely used in industry. The so-called intumescent technical coatings are special coatings for special purposes. Their application shall be performed only by trained experts on the basis of fire safety specialists recommendation, wherein the exact thickness of coating has to be followed in application.

The aim of intumescent coatings with higher fire-resistance is to increase the resistance of industrial buildings against fire in case of e.g. burning of building constructions, or possibly to prolong their functionality in case of e.g. burning of electric cables. Intumescent coatings or coating materials are most commonly used in practice. During fire, the coating is getting swollen (thus creating a mechanical barrier), which process is allowed due to a component comprising phosphorus. The swelling of coating provides the industrial buildings with protection against destructive effects of fire, if possible until the time the fire can be extinguished. Therefore, the intumescent coatings can be applied only by experts trained for handling these materials, and the exact thickness of coatings on the basis previous recommendations of fire safety specialists has to be followed during their application. Also, they are sold in specialized shops.

The known coating materials usually include swelling components, film-making binding components, which provide for making the film and for adhesion to a substrate, on which the material is applied, and alternatively they can comprise various pigments and other colouring agents.

For example US 3 654 190 discloses an intumescent coating increasing the fire resistance, comprising melamine, dipentaerythritol, a component comprising phosphorus, and chlorinated paraffin. A disadvantage of the said coating consists in its low resistance against weather conditions, as well as its cracking (destruction) during the fire.

US-A-3 635 970 discloses an oil coating, comprising not only melamine pyrophosphate and dipentaerythritol, but also chlorinated paraffin as a component which suppresses burning.

US-A-4 965 296 discloses a liquid intumescent coating comprising not only ammonium phosphate, diammonium phosphate, ammonium polyphosphate or potassium tripolyphosphate, or combinations thereof, but also dipentaerythritol, polyol or chlorinated paraffin, or combinations thereof, melamine resin, urea, or dicyandiamide, or combinations thereof, in the amount of 5 to 35 % w/w. Its disadvantages include low resistance against weather conditions, as well as relatively low plasticity of intumescence due to a high viscosity of carbon layer, which decreases thermal-insulation properties.

Besides the above mentioned low resistance to weather conditions, most of the presently available and used fire-resistance coatings are insufficiently adhesive and thus insufficiently resistant to abrasion and also liable to mechanical damage. Moreover, they have quite a high degree of humidity absorbing.

The object of the present invention is to provide a fire-resistance coating material with eliminated undesired properties of previously known and used intumescent technical coatings.

### Summary of the Invention

The above mentioned disadvantages are substantially eliminated by fire-resistant coating material ADINA according to the present invention, comprising ammonium polyphosphate in the amount of 5 to 50 % w/w, pentaerythritol in the amount of 6 to 33 % w/w, melamine in the amount of 4 to 22 % w/w, binder (adhesive based on dispersion of polyvinylacrylate – PVAcry, preferably of quality degree D3) in the amount of 10 to 16,3 % w/w, plasticizer based on diisononylphthalate (DINP) in the amount of 2,3 to 3,5 % w/w, talc in the amount of 3 to 10 % w/w, stabilizer (preservative) based on 4-chloro-3-methylphenol in the amount of 0,15 to 0,25 % w/w, and water in the amount of 13,5 to 17 % w/w.

It was found out that the coating material ADINA according to the present invention preferably comprises ammonium polyphosphate in the amount of 25 to 35 % w/w, pentaerythritol in the amount of 16 to 25 % w/w, melamine in the amount of 9 to 17 % w/w, binder in the amount of 12,5 to 16 % w/w, plasticizer in the amount of 2,8 to

3,2 % w/w, talc in the amount of 6 to 8,5 % w/w, stabilizer in the amount of 0,18 to 0,22 % w/w, and water in the amount of 11 to 15,5 % w/w.

It was also found out that it is possible to use other phosphate derivative as well, e.g. ammonium polyphosphate, instead of melamine it is possible to use its derivatives, e.g. melamine cyanurate, melamine borate, melamine polyphosphate, melamine diphosphate, melamine pyrophosphate and melamine phosphate, and it is also possible to use monopentaerythritol or dipentaerythritol.

By adjusting the contents of individual components it is possible to gain the coating material ADINA with different physicochemical properties, which allow its use in various industrial fields.

The coating material ADINA according to the present invention can be prepared by simple mixing of individual components in the homogenizer.

The advantage of the present coating material ADINA consists mainly in the fact that although it is the so-called technical coating, its physicochemical properties can compete with decorative and technical coatings, which have higher requirements for these parameters. These particularly include an exceptional adhesiveness, which in combination with plasticity creates a high (thick) carbon layer during the fire, being gradually getting bigger and swollen due to high temperatures during the fire (because the carbon layer contains air bubbles), and provides for extraordinary thermal-insulation properties even if only a thin layer is applied.

The examples below illustrate the present invention without limiting its scope.

### Examples

#### Example No. 1

Fire-resistant coating material ADINA for application by rolling.

#### Composition:

Ammonium phosphate	31 % w/w
Pentaerythritol	18 % w/w
Melamine	13 % w/w
Binder (adhesive based on PVAcry)	14 % w/w

Water	13,8 % w/w
Plasticizer (DINP)	3 % w/w
Stabilizer (PARMETOL)	0,2 % w/w
Talc	7 % w/w

Process for production (identical for all types of ADINA coating materials)

Individual components were dosed and homogenized in the homogenizer in the following order: ammonium polyphosphate, pentaerythritol, melamine and talc, and were thoroughly stirred.

The binder part of the fire-resistant coating material was prepared and homogenized separately, comprising 2/3 of water from the total amount + adhesive based on PVAcry + DINP + stabilizer, and was added to the mixture of ammonium polyphosphate, pentaerythritol, melamine and talc, homogenized and finally the remaining 1/3 of water was added.

#### Example No. 2

Fire-resistant coating material ADINA for application by levelling.

#### Composition:

Ammonium phosphate	7 % w/w
Pentaerythritol	31 % w/w
Melamine	22 % w/w
Binder (adhesive based on PVAcry)	14 % w/w
Water	15,8 % w/w
Plasticizer (DINP)	3 % w/w
Stabilizer (PARMETOL)	0,2 % w/w
Talc	7 % w/w

## Example No. 3

Fire-resistant coating material ADINA for application by filling (thin consistency).

Composition:

Ammonium phosphate	40 % w/w
Pentaerythritol	8 % w/w
Melamine	10,8 % w/w
Binder (adhesive based on PVAcry)	14 % w/w
Water	17 % w/w
Plasticizer (DINP)	3 % w/w
Stabilizer (PARMETOL)	0,2 % w/w
Talc	7 % w/w

## Example No. 4

Fire-resistant coating material ADINA for application by spraying.

Composition:

Ammonium phosphate	30 % w/w
Pentaerythritol	18 % w/w
Melamine	12 % w/w
Binder (adhesive based on polyvinylacrylate)	14 % w/w
Water	15,8 % w/w
Plasticizer (DINP)	3 % w/w
Stabilizer (PARMETOL)	0,2 % w/w
Talc	7 % w/w

Comparison of physicochemical properties of fire-resistant coating material ADINA according to Example 1 and wood and metal paint for exterior use is shown in the table below.

Table

Technical properties	Material of Example 1	ACTIN W (technical data sheet)
Colour	white	white
Dry matter content	min. 70 %	bright min. 40 % matte min. 50 %
Volume weight	1400 kg/m <sup>3</sup>	bright cca 1100 kg/m <sup>3</sup> matte cca 1400 kg/m <sup>3</sup>
Viscosity	1500-6700 mPa.s	cca 1500-6000 mPa.s
Adhesive power to the base	min. 0.25 MPa	min. 0.25 MPa
Adhesive power to the base after test of resistance to sudden changes of temperature	min. 0.25 MPa	min. 0.25 MPa
Frost resistance (adhesiveness to the base after 15 freezing cycles)	min. 0.25 MPa	min. 0.25 MPa
Equivalent diffusion thickness RH20	max. 1 m	max. 1.5 m
Abrasion-resistance	min. 20 minutes	min. 20 minutes
Water-resistance	0 L/m <sup>2</sup> . 30 minutes	0 L/m <sup>2</sup> . 30 minutes

As can be seen in the table above, the fire-resistant coating material ADINA meets all physicochemical requirements not only for fire-resistant coatings, but also for standard technical and decorative coatings.

## C L A I M S

1. Fire-resistant coating material ADINA, **characterized in that** it comprises ammonium polyphosphate in the amount of 5 to 50 % w/w, pentaerythritol in the amount of 6 to 33 % w/w, melamine in the amount of 4 to 22 % w/w, binder based on polyvinylacrylate dispersion in the amount of 10 to 16,3 % w/w, plasticizer based on diisononylphthalate in the amount of 2,3 to 3,5 % w/w, talc in the amount of 3 to 10 % w/w, stabilizer based on 4-chloro-3-methylphenol in the amount of 0,15 to 0,25 % w/w, and water in the amount of 13,5 to 17 % w/w.
2. Fire-resistant coating material according to claim 1, **characterized in that** it comprises ammonium polyphosphate in the amount of 25 to 35 % w/w, pentaerythritol in the amount of 16 to 25 % w/w, melamine in the amount of 9 to 17 % w/w, binder in the amount of 12,5 to 16 % w/w, plasticizer in the amount of 2,8 to 3,2 % w/w, talc in the amount of 6 to 8,5 % w/w, stabilizer in the amount of 0,18 to 0,22 % w/w, and water in the amount of 11 to 15,5 % w/w.



# INTERNATIONAL SEARCH REPORT

International application No  
PCT/SK2012/050001

<b>A. CLASSIFICATION OF SUBJECT MATTER</b> INV. C09D5/18 C09D133/08 C08K5/053 C08K5/136 C08K3/32 C08K3/34 C08K5/3492 C08K5/12 ADD. According to International Patent Classification (IPC) or to both national classification and IPC														
<b>B. FIELDS SEARCHED</b> Minimum documentation searched (classification system followed by classification symbols) C09D C08L Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched Electronic data base consulted during the international search (name of data base and, where practicable, search terms used) EPO-Internal, CHEM ABS Data														
<b>C. DOCUMENTS CONSIDERED TO BE RELEVANT</b> <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 10%;">Category*</th> <th style="width: 70%;">Citation of document, with indication, where appropriate, of the relevant passages</th> <th style="width: 20%;">Relevant to claim No.</th> </tr> </thead> <tbody> <tr> <td style="text-align: center; vertical-align: top;">A</td> <td>           WO 94/02545 A1 (ALCAN INT LTD [CA];            WAINWRIGHT ROBIN [GB]; EVANS KENNETH            ARTHUR [GB]) 3 February 1994 (1994-02-03)            page 1, line 3 - line 8            pages 10-11            -----         </td> <td style="text-align: center; vertical-align: top;">1,2</td> </tr> <tr> <td style="text-align: center; vertical-align: top;">A</td> <td>           WO 2010/131037 A1 (TREMCO ILLBRUCK            COATINGS LTD [GB]; BROOKS RODNEY [GB];            JONES SIMON [GB])            18 November 2010 (2010-11-18)            examples            claims            -----         </td> <td style="text-align: center; vertical-align: top;">1,2</td> </tr> <tr> <td style="text-align: center; vertical-align: top;">A</td> <td>           US 3 654 190 A (LEVINE DONALD)            4 April 1972 (1972-04-04)            the whole document            -----         </td> <td style="text-align: center; vertical-align: top;">1,2</td> </tr> </tbody> </table>			Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.	A	WO 94/02545 A1 (ALCAN INT LTD [CA]; WAINWRIGHT ROBIN [GB]; EVANS KENNETH ARTHUR [GB]) 3 February 1994 (1994-02-03) page 1, line 3 - line 8 pages 10-11 -----	1,2	A	WO 2010/131037 A1 (TREMCO ILLBRUCK COATINGS LTD [GB]; BROOKS RODNEY [GB]; JONES SIMON [GB]) 18 November 2010 (2010-11-18) examples claims -----	1,2	A	US 3 654 190 A (LEVINE DONALD) 4 April 1972 (1972-04-04) the whole document -----	1,2
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<div style="display: flex; justify-content: space-between;"> <div> <input type="checkbox"/> Further documents are listed in the continuation of Box C.         </div> <div> <input checked="" type="checkbox"/> See patent family annex.         </div> </div>														
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Date of the actual completion of the international search  <div style="text-align: center; font-size: 1.2em;">29 June 2012</div>	Date of mailing of the international search report  <div style="text-align: center; font-size: 1.2em;">09/07/2012</div>													
Name and mailing address of the ISA/ European Patent Office, P.B. 5818 Patentlaan 2 NL - 2280 HV Rijswijk Tel. (+31-70) 340-2040, Fax: (+31-70) 340-3016	Authorized officer  <div style="text-align: center; font-size: 1.2em;">Behm, Sonja</div>													

# INTERNATIONAL SEARCH REPORT

Information on patent family members

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