

COATING WITH IMPROVED DIRT PICK-UP RESISTANCE

The present invention relates to coatings having improved dirt pick-up resistance, particularly at high ambient temperatures and in high humidity.

After exposure to the atmosphere, exterior coatings tend to pick up particles of atmospheric dirt, which causes a slight discolouring of the coating with time. This problem is greater in hot and humid conditions when coatings are more tacky. It can be reduced by employing a polymer having a relatively high glass transition temperature (Tg); however, coatings containing high Tg polymers have other disadvantages such as lack of flexibility and a need for volatile organic coalescents to effect film formation, and thus a coating containing purely high Tg polymers is generally not desirable.

Another solution to the problem is to employ a two-stage polymer, having a low Tg portion and a high Tg one. US 5063091 discloses two-stage polymers for use as a thick elastomeric coating comprising methyl methacrylate, butyl acrylate and N-methylol methacrylamide. Such polymers are said to have relatively low tack at high temperatures, and thus good dirt pick-up resistance, despite at least one stage having a low glass transition temperature (Tg); this is due to the presence of the hard, high Tg phase. However, two stage polymers are more difficult to manufacture and are undesirable in certain applications because of problems caused by the incompatibility of the hard and soft phases. Furthermore, the coatings disclosed in US 5063091 are relatively thick, and are not suitable for all applications. Accordingly there is still a need for a single stage polymer which has a suitable dirt pick-up resistance without the attendant disadvantages of a very high Tg component.

US 3749690 discloses latex paints comprising an aqueous single-stage polymer emulsion of, *inter alia*, methacrylic acid, N-methylolacrylamide, ethyl acrylate and acrylonitrile. Such compositions are said to have a good spread of properties such as burnish resistance, scrub resistance, stain removal and low-temperature coalescence. There is no indication as to whether or not these compositions have good dirt pick-up resistance, particularly at high temperatures and at high humidity.

We have discovered that certain known single stage polymer compositions, despite having relatively low Tgs, provide coatings which exhibit surprisingly good dirt pick-up resistance, particularly in hot and humid conditions, compared with coatings based on compositions having significantly higher Tgs.

Accordingly the present invention comprises in one aspect the use of a single-stage polymer comprising as monomer components:

N-methylol (meth)acrylamide, and one or more of alkyl acrylates, alkyl methacrylates, styrene, vinyl acetate and/or vinyl esters; and having a Tg of from -20°C to 40°C, to improve the dirt pickup resistance of a dried aqueous coating composition at temperatures of 25°C or higher and a relative humidity of at least 80%.

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The invention is especially valuable for improving the dirt pickup resistance of coating compositions in conditions of high ambient temperature (eg over 25°C, particularly over 30°C) and high relative humidity (eg over 80%, particularly over 90%).

It is believed that the presence of the N-methylol (meth)acrylamide is responsible for the surprisingly good dirt pickup performance. Thus in a further aspect the invention provides a method of improving the dirt pickup resistance at temperatures of 25°C or higher and a relative humidity of at least 80% of a dried aqueous coating composition which contains a single-stage polymer having a Tg of from -20°C to 40°C and comprising monomer units of one or more of alkyl acrylates, alkyl methacrylates, styrene, vinyl acetate and/or vinyl esters, comprising incorporating with said monomers units, prior to polymerization, units of N-methylol (meth)acrylamide.

The N-methylol (meth)acrylamide is generally present in the polymer composition at a level of from 1 to 15 % by weight, although more may be used if its presence is desired for other purposes.

Preferred polymer compositions for use in the invention comprise monomer units of N-methylol (meth)acrylamide, (C₁-C₈)alkyl acrylate and (C₁-C₄)alkyl methacrylate. More preferred are compositions comprising 1-6 % by weight N-methylol (meth)acrylamide, 20-70 % by weight (C₁-C₄)alkyl acrylate, and 20-70 % by weight (C₁-C₄)alkyl methacrylate.

It is also preferred that polymer compositions for use in the invention have a Tg of between 0 and 40°C, more preferably between 10 and 30°C.

EXAMPLES

Coatings were prepared containing as binders three different compositions as specified below.

Binder A:

Polymer of methyl methacrylate/ethyl acrylate/N-methylol acrylamide (45/51/4 wt%)

Binder B:

Polymer of methyl methacrylate/butyl acrylate/N-methylol acrylamide (59.8/36.2/4 wt%)

Binder C (comparative):

Polymer of methyl methacrylate/butyl acrylate/ureido-functional methacrylate/methacrylic acid (52.4/45.6/1/1 wt%)

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The coatings had the following compositions (all weights in kg):

	<u>BINDER A</u>	<u>BINDER B</u>	<u>BINDER C</u>
<u>Grind preparation:</u>			
Propylene glycol	40	40	40
Water	130	130	130
TAMOL 731 (25%)	18	18	18
NOPCO NXZ	5	5	5
PRIMAL QR-708 (35%)	16.23	1.0	2.0
HMT (10%)	2.4	2.4	2.4
SKANE M8	4.8	4.8	4.8
KATHON LX 1.5	1	1	1
TI-PURE R960	225	225	225
Calcium carbonate	125	125	125

Ground for 15-20 minutes, then let down with the following:

Binder	485 (A)	485 (B)	442 (C)
Water	42.24	42.24	100
OPAQUE OP-62	135	135	135
NOPCO NXZ	2	2	2
PRIMAL RM-1020	28	28	28
TEXANOL	34	34	22

The three coatings were coated on asbestos panels, which had been sealed with PRIMAL WL-91. Two coats were applied at intervals of 24 hours, and panels exposed to North (vertical) and South (vertical, at 5° and at 45°) in Singapore.

After one month's exposure, the panels containing Binders A and B were much cleaner than that containing C, with Binder A slightly better than B.



CLAIMS:

1. Use of a single-stage polymer comprising as monomer components:
N-methylol (meth)acrylamide, and one or more of alkyl acrylates, alkyl methacrylates,
5 styrene, vinyl acetate and/or vinyl esters; and having a Tg of from -20°C to 40°C, to
improve the dirt pickup resistance of a dried aqueous coating composition at temperatures of
25°C or higher and a relative humidity of at least 80%.
2. Method of improving the dirt pickup resistance at temperatures of 25°C or higher and
10 a relative humidity of at least 80% of a dried aqueous coating composition which contains a
single-stage polymer having a Tg of from -20°C to 40°C and comprising monomer units of
one or more of alkyl acrylates, alkyl methacrylates, styrene, vinyl acetate and/or vinyl esters,
comprising incorporating with said monomers units, prior to polymerization, units of N-
methylol (meth)acrylamide.
- 15 3. Use or method according to any preceding claim wherein the Tg of the polymer is
between 0 and 40°C.
4. Use or method according to claim 3 wherein the Tg of the polymer is between 10 and
20 30°C.
5. Use or method according to any preceding claim wherein the N-methylol
(meth)acrylamide is present in the polymer at a level of from 1 to 15% by weight.
- 25 6. Use or method according to any preceding claim wherein the polymer comprises units
of N-methylol (meth)acrylamide, (C₁-C₈)alkyl acrylate and (C₁-C₄)alkyl methacrylate.
7. Use or method according to claim 5 and claim 6 wherein the polymer comprises 1-6%
by weight N-methylol (meth)acrylamide, 20-70% by weight (C₁-C₈)alkyl acrylate, and 20-
30 70% by weight (C₁-C₄)alkyl methacrylate.
8. Use or method according to claim 6 or claim 7 wherein the polymer comprises units
of N-methylol (meth)acrylamide, butyl or ethyl acrylate and methyl methacrylate.

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