METHOD FOR IMPROVING THE CLEANABILITY OF AN EPOXY PAINT COAT ON A SURFACE

FIELD OF THE INVENTION

The present invention relates to the field of cargo holds for solid cargos, and methods and compositions for improving their cleanability.

BACKGROUND OF THE INVENTION

Cargo holds are typically used to transport solid (i.e. bulk) cargos, rather than e.g. liquid cargos. Cargo holds must be regularly cleaned, e.g. when changing from one cargo type to another. Cargo holds must also resist the abrasion and impact which can occur when solid cargos are loaded or unloaded. Abrasion and impact can cause damage to a cargo hold coating, which then contributes negatively to the cleanability of said coating.

The specific requirements of cargo holds place corresponding requirements on the protective coatings which are present on said cargo holds. Cargo hold coatings may comprise additional components which provide improved cleanability of the coatings.

However, there is a need for additional methods for improving the cleanability of an epoxy paint coat on a surface, in particular the surface of a cargo hold, as well as paint coats for providing such properties. Such paint coats should be compatible with existing coatings and also provide good physical properties such as good abrasion resistance, good impact resistance and corrosion resistance.

Patent publications in this field include US 2010/316875 A1, WO2017/140610, WO2012/119968 and WO2008/130943. Other publications include HERRWERTH S ET AL: "Core-shell Silicone Elastomer Particles", Paint and Coatings Magazine, 1 May 2015, Evonik Nutrition & Care: "Abidur EP 2240 A", CHEN J ET AL: Polymer, vol. 54, no. 16 , pages 4276-4289, and YORKGITIS EM ET AL: ADVANCED IN POLYMER SCI, BERLIN, DE, vol. 72, 1 January 1985.

SUMMARY

In an aspect, a method off~~or~~ improving the cleanability of an epoxy paint coat on a surface, is therefore provided, said method comprising the steps of:

a) applying a paint composition onto the surface thereby forming a curable paint film on the surface, which composition comprises an epoxy based binder system of:

i. one or more epoxy resins,
ii. one or more curing agents, and
iii. a silicone polymer; and

b) allowing said curable paint film to cure to obtain the epoxy paint coat, wherein the silicone polymer constitutes between 1.4 % - 8 % silicone polymer based on volume solids of the paint composition.

Further provided herein, in another aspect, is method of~~for~~ improving the cleanability of an epoxy paint coat on a surface, said method comprising the steps of:

a) applying a paint composition onto the surface thereby forming a curable paint film on the surface, which composition comprises an epoxy based binder system of:

i. one or more epoxy resins,
ii. one or more curing agents, and
iii. a co-binder comprising a silicone polymer in an epoxy resin; and

b) allowing said curable paint film to cure to obtain the epoxy paint coat, wherein the silicone polymer constitutes between 1.4 % - 8 % silicone polymer based on volume solids of the paint composition.

Further provided herein, in another aspect, is method of~~for~~ improving the cleanability of an epoxy paint coat on a surface, said method comprising the steps of:

a) applying a paint composition onto the surface thereby forming a curable paint film on the surface, which composition comprises an epoxy based binder system of:

i. one or more epoxy resins,
ii. one or more curing agents, and
iii. a co-binder comprising a silicone polymer in an epoxy resin in the form of a silicone core shell rubber; and

b) allowing said curable paint film to cure to obtain the epoxy paint coat, wherein the silicone polymer constitutes between 1.4 % - 8 % silicone polymer based on volume solids of the paint composition.

Further provided herein, in another example~~aspect~~, is method for improving the cleanability of an epoxy paint coat on a surface, said method comprising the steps of:

a) applying a paint composition onto the surface thereby forming a curable paint film on the surface, which composition comprises an epoxy based binder system of:

i. one or more epoxy resins,

ii. one or more curing agents, and

iii. a co-binder comprising a silicone polymer in an epoxy resin, wherein the silicone polymer constitutes at least 1.4 % silicone polymer based on volume solids of the paint composition; and

b) allowing said curable paint film to cure to obtain the epoxy paint coat.

CLAIMS

1. A method ~~for~~of improving the cleanability of an epoxy paint coat on a surface, said method comprising the steps of:
    a. applying a paint composition onto the surface thereby forming a curable paint film on the surface, which composition comprises an epoxy based binder system of:
        i. one or more epoxy resins,
        ii. one or more curing agents, and
        iii. a silicone polymer; and
    b. allowing said curable paint film to cure to obtain the epoxy paint coat~~.~~, wherein the silicone polymer constitutes between 1.4 % - 8 % silicone polymer based on volume solids of the paint composition.

2. A method ~~for~~of improving the cleanability of an epoxy paint coat on a surface, said method comprising the steps of:
    a. applying a paint composition onto the surface thereby forming a curable paint film on the surface, which composition comprises an epoxy based binder system of:
        i. one or more epoxy resins,
        ii. one or more curing agents, and
        iii. a co-binder comprising a silicone polymer in an epoxy resin; and
    b. allowing said curable paint film to cure to obtain the epoxy paint coat~~.~~, wherein the silicone polymer constitutes between 1.4 % - 8 % silicone polymer based on volume solids of the paint composition.

3. A method ~~for~~of improving the cleanability of an epoxy paint coat on a surface, said method comprising the steps of:
    a. applying a paint composition onto the surface thereby forming a curable paint film on the surface, which composition comprises an epoxy based binder system of:
        i. one or more epoxy resins,
        ii. one or more curing agents, and
        iii. a co-binder comprising a silicone polymer in an epoxy resin in the form of a silicone core shell rubber; and
    b. allowing said curable paint film to cure to obtain the epoxy paint coat~~.~~ , wherein the silicone polymer constitutes between 1.4 % - 8 % silicone polymer based on volume solids of the paint composition.

~~4. The method according to any one of claims 1-3, wherein the silicone polymer constitutes at least 1.4 % silicone polymer based on volume solids of the paint composition.~~

~~5. A method for improving the cleanability of an epoxy paint coat on a surface, said method comprising the steps of:~~

~~a. applying a paint composition onto the surface thereby forming a curable paint film on the surface, which composition comprises an epoxy based binder system of:~~

~~i. one or more epoxy resins,~~

~~ii. one or more curing agents, and~~

~~iii. a co-binder comprising a silicone polymer in an epoxy resin, wherein the silicone polymer constitutes at least 1.4 % silicone polymer based on volume solids of the paint composition; and~~

~~b. allowing said curable paint film to cure to obtain the epoxy paint coat.~~

~~6.~~4. The method according to any one of claims 1-~~3~~5, wherein the silicone polymer constitutes at least 1.6 % silicone polymer based on volume solids of the paint composition, the silicone polymer constitutes at least 2.0 % silicone polymer based on volume solids of the paint composition, the silicone polymer constitutes at least 2.2 % silicone polymer based on volume solids of the paint composition or the silicone polymer constitutes at least 2.5 % silicone polymer based on volume solids of the paint composition.

~~7.~~5. The method according to any one of the preceding claims, wherein the silicone polymer constitutes ~~at the most 10 % silicone polymer based on volume solids of the paint composition, wherein the silicone polymer constitutes at the most 9 % silicone polymer based on volume solids of the paint composition, the silicone polymer constitutes at the most 8 % silicone polymer based on volume solids of the paint composition, the silicone polymer constitutes~~ at the most 7 % silicone polymer based on volume solids of the paint composition or the silicone polymer constitutes at the most 6 % silicone polymer based on volume solids of the paint composition.

~~8. The method according to any one of the preceding claims, wherein the silicone polymer constitutes between 1.4 % - 10 % silicone polymer based on volume solids of the paint composition, the silicone polymer constitutes between 1.6 % - 9 % silicone polymer based on volume solids of the paint composition, the silicone polymer constitutes between 2.0 %- 8 % silicone polymer based on volume solids of the paint composition, the silicone polymer constitutes between 2.2 %- 7 % silicone polymer based on volume solids of the paint composition, or the silicone polymer constitutes between 2.5 % - 6 % silicone polymer based on volume solids of the paint composition.~~

~~9.~~6. The method according to any one of the preceding claims, wherein the silicone polymer is epoxy-functional.

~~10.~~7. The method according to any one of the preceding claims, wherein the silicone polymer is mixed in the epoxy resin.

~~11.~~8. The method according to any one of the preceding claims, wherein the silicone polymer is in the form of silicone core shell rubber.

~~12.~~9. The method according to any one of claims 3-8~~11~~, wherein the silicone core shell rubber is epoxy-functional.

~~13.~~10. The method according to any one of claims 3-9~~12~~, wherein the silicone core shell rubber is mixed in the epoxy resin.

~~14.~~11. The method according to any one of claims 3-10~~13~~, wherein the epoxy-functional silicone core shell rubber has a silicone core and a plurality of epoxy surface moieties.

~~15. The method according to any one of claims 2-14, wherein component (iii) is added in an amount of at least 4 % based on volume solids of the paint composition, is added in an amount of at least 6 % based on volume solids of the paint composition or in an amount of at least 7 % based on volume solids of the paint composition.~~

~~16. The method according to any one of claims 2-15, wherein component (iii) is added in an amount of at the most 25 % based on volume solids of the paint composition, in an amount of at the most 20 % based on volume solids of the paint composition, in an amount of at the most 17 % based on volume solids or in an amount of at the most 16 % based on volume solids.~~

~~17.~~12. The method according to ~~any one of~~ claim~~s~~ 2 or 3~~-16~~, wherein component (iii) is added in an amount of between 4-25 % based on volume solids of the paint composition, in an amount of between 6-20 % based on volume solids of the paint composition or in an amount of between 7-17 % based on volume solids of the paint composition.

~~18.~~13. The method according to any one of claims 2-12~~17~~, wherein the ratio of silicone polymer: epoxy resin in component (iii) is in the range of 1:10 – 1:1, preferred in the range of 1:6 – 1:1, more preferred in the range of 1:5 - 1:1 and most preferred in the range of 1:4 – 1:1 such as 1:3 – 1:1.5.

~~19.~~14. The method according to any one of claims 2-13~~18~~, wherein the epoxy resin in component (iii) is one or more epoxy resins selected from the group consisting of bisphenol A, bisphenol F, Novolac epoxies, reactive diluents, non-aromatic epoxies,

cycloaliphatic epoxies, glycidyl esters and epoxy functional acrylics or any combinations hereof.

~~20.~~15. The method according to any one of the preceding claims, wherein the one or more epoxy resins (component i) is selected from the group consisting of bisphenol A, bisphenol F, Novolac epoxies, reactive diluents, non-aromatic epoxies, cycloaliphatic epoxies, glycidyl esters and epoxy functional acrylics or any combinations hereof.

~~21.~~16. The method according to any one of the preceding claims, wherein the one or more curing agents is selected from the group consisting of polyamides, aliphatic amines, cycloaliphatic amines, polyamines, polyamidoamines, polyoxyalkylene amines, aminated polyalkoxyethers, aliphatic amines, aralkylamines, aromatic amines, Mannich bases, amino functional silicones or silanes, and including epoxy adducts and derivatives thereof.

~~22.~~17. The method according to any one of the preceding claims, wherein the one or more curing agents comprises a polyamide and/or a polyamine.

~~23.~~18. The method according to any one of the preceding claims, wherein the one or more curing agents comprises Mannich bases.

~~24.~~19. The method according to any one of the preceding claims, wherein the one or more curing agents does not comprise Mannich bases.

~~25.~~20. The method according to any one of the preceding claims, wherein the coating composition comprises one or more pigments and/or fillers.

~~26.~~21. The method according to any one of the preceding claims, wherein the paint composition comprises a plasticizer selected from the group consisting of hydrocarbon resins, phthalates, esters, benzoates, phosphates, paraffins, amides, and benzyl alcohol.

~~27.~~22. The method according to any one of the preceding claims, wherein the paint composition comprises 1-7% by solids volume of the paint of an aluminium pigment, bauxite or glass spheres.

~~28.~~23. The method according to any one of the preceding claims, wherein the coating composition is obtained by mixing the components of the epoxy based binder system by first combining component (i) and component (iii) followed by addition of component (ii) or by combining all three components of the epoxy based binder system.

~~29.~~24. The method according to any one of the preceding claims, wherein the paint composition is applied directly on the surface.

~~30.~~25. The method according to any one of the preceding claims, wherein a primer layer is applied to the surface prior to application of the paint composition.

~~31.~~26. The method according to any one of claims 1-25~~30~~, wherein the epoxy paint coat is on the surface of a cargo hold.

~~32.~~27. The method according to any one of claims 1-26~~31~~, wherein the epoxy paint coat is on the surface of a cargo hold for carrying solid cargos.

~~33.~~28. Use of a paint composition comprising component (i), component (ii) and component (iii) as defined in any one of claims 1-27~~32~~ for improving the cleanability of an epoxy paint coat on a surface.

~~34.~~29. A paint composition comprising component (i), component (ii) and component (iii) as defined in any one of claims 1-27~~32~~.

~~35.~~30. A kit-of-parts for use in the method according to any one of claims 1-27~~32~~, said kit comprising a first container comprising component (i) and component (iii); and a second container comprising component (ii);
or said kit comprising a first container comprising component (i); a second container comprising component (ii) and a third container comprising component (iii); wherein component (i), component (ii) and component (iii) are as defined in any one of claims 1-27~~32~~.