[0005] Prior attempts to address the issues mentioned herein with mineral wool insulation have been through a coating that can be applied to pipes to provide the insulation and thermal protective properties while also being relatively non-porous and preventing exposure of the pipes to moisture. Prior coating products are typically water-based and must be applied in relatively thin coats onto a hot surface (such as about 190°F to about 210°F or about 200°F) for the coatings to properly adhere to the pipes. As the products are water based, the water must be removed to form the final product, which can cause challenges in maintaining a uniform coating on the pipe or other object as the coating is dried, which can be hindered by high ambient humidity levels. Further, existing products generally require thin, multiple coats to achieve the thickness required to provide adequate insulation and thermal protective properties to the pipes, thus causing the application of this insulation to be just as, if not more, labor intensive than wrapping and cladding traditional mineral wool.

BRIEF DESCRIPTION

[0006] The subject application involves an inorganic and organic insulating polymer comprising a methyl phenyl silicone polyester with a thixotropic index from about 6 to about 9. The polyester is a polymerized reaction product between a multifunctional silicone acrylate or silicone methacrylate having a reactive functionality greater than 3 and one or more multifunctional acrylate or methacrylate monomers in the presence of an initiator and, in some approaches, also a reducer. In one approach, the polyester has a weight average molecular weight of about 2,000 to about 6,500. In another approach, the methyl phenyl silicone polyester gels within about 30 to about 60 seconds and cures within about 40 to about 80 total seconds so that it can preferably be spray applied to a pipe or other object to provide insulation and protection without sagging or deformation.

[0006a] In one aspect of the present disclosure, there is provided a method of applying an inorganic and organic insulating polymer to an object to provide an insulating

coating, the method comprising:
reacting a multifunctional silicone acrylate or silicone methacrylate having a reactive functionality greater than 3 and one or more multifunctional acrylate or methacrylate monomers in the presence of an initiator to form a methyl phenyl silicone polyester having a thixotropic index from 6 to 9; and
applying the methyl phenyl silicone polyester to the object in an amount to provide an insulating coating having an R-value of greater than 0.352 K·m2/W (2 ft2·°F·h/BTU), wherein the methyl phenyl silicone polyester gels in 30 to 60 seconds and cures within 40 to 80 total seconds, when cured at ambient temperatures, and wherein the applying includes spraying.

[0007] In an embodiment, the multifunctional silicone acrylate or silicone methacrylate is the product of a reaction between a multifunctional silicone polyol with a reactive functionality of greater than about 3 to about 8 and acrylic or methacrylic acid at a temperature from about 80°C to about 150°C, and in other approaches, 100°C to about 120°C and in the presence of a catalyst and stabilizer to provide a controlled reaction. In one approach, the catalyst is one or more organic acids and the stabilizer is one or more phenolic compounds. In other approaches, the catalyst includes a strong acid and a weak acid. In yet another approach, the one or more phenolic compounds include t-butyl hydroquinone.

[0008] In an embodiment, the one or more multifunctional acrylate or methacrylate monomers are selected from a cyclic ether acrylate, a cyclic ether methacrylate, alkoxy acrylates, alkoxy diacrylates, alkoxy methacrylates, alkoxy dimethacrylates, and combinations thereof. In another aspect, the one or more multifunctional acrylate or methacrylate monomers are selected from 1,4-butanediol diacrylate or dimethacrylate, tetrahydrofurfuryl acrylate or methacrylate, and combinations thereof.

[0009] In an embodiment, the initiator is a peroxide, and preferably in another aspect, benzoyl peroxide.

[0010] In an embodiment, the polyester includes about 10% to about 30% weight percent silicone.

[0011] The subject application also involves a method of applying an inorganic and organic insulating polymer to an object to provide insulation and protection. By one approach, the method includes reacting a multifunctional silicone acrylate or silicone methacrylate having a reactive functionality greater than about 3 and one or more multifunctional acrylate or methacrylate monomers in the presence of an initiator and, in some approaches, also a reducer to form a methyl phenyl silicone polyester having a thixotropic index from about 6 to about 9. The methyl phenyl silicone polyester may be applied, such as by spraying, to the object in an amount to provide insulation wherein the methyl phenyl silicone polyester gels in about 30 to about 60 seconds and cures within about 40 to about 80 total seconds. The polyester may be applied without sagging and deformation to the outer surfaces of the object and not within a defined cavity. In some approaches, the applying includes spraying, pumping through static mix heads, brushing, coating, application via a spatula or other applicator, and combinations thereof.

[0012] In an embodiment, the methyl phenyl silicone polyester has a weight average molecular weight of about 2,000 to about 6,500.

[0013] In an embodiment, the multifunctional silicone acrylate or silicone methacrylate is the product of a reaction between a multifunctional silicone polyol with a reactive functionality of greater than about 3 to about 8 and acrylic or methacrylic acid at a temperature from about 80°C to about 150°C (and, in other approaches, about 100 to about 120°C) and in the presence of a catalyst and stabilizer. In some approaches, the catalyst is one or more organic acids and the stabilizer is one or more phenolic compounds. In other approaches, the catalyst includes a strong acid and a weak

CLAIMS

We claim:

1. A method of applying an inorganic and organic insulating polymer to an object to provide an insulating coating, the method comprising:
reacting a multifunctional silicone acrylate or silicone methacrylate having a reactive functionality greater than 3 and one or more multifunctional acrylate or methacrylate monomers in the presence of an initiator to form a methyl phenyl silicone polyester having a thixotropic index from 6 to 9; and
applying the methyl phenyl silicone polyester to the object in an amount to provide an insulating coating having an R-value of greater than 0.352 K·m2/W (2 ft2·°F·h/BTU), wherein the methyl phenyl silicone polyester gels in 30 to 60 seconds and cures within 40 to 80 total seconds, when cured at ambient temperatures, and wherein the applying includes spraying.

2. The method of claim 1, wherein the methyl phenyl silicone polyester has a weight average molecular weight of 2,000 to 6,500.

3. The method of claim 1, wherein the multifunctional silicone acrylate or methacrylate is the product of a reaction between a multifunctional silicone polyol with a reactive functionality of greater than 3 to 8 and acrylic or methacrylic acid at a temperature from 80 to 150°C and in the presence of a catalyst and stabilizer.

4. The method of claim 3, wherein the catalyst is one or more organic acids and the stabilizer is one or more phenolic compounds.

5. The method of claim 4, wherein the catalyst includes a strong acid and a weak acid.

6. The method of claim 4, wherein the one or more phenolic compounds include t-butyl hydroquinone, methyl hydroquinone, tert-butyl catechol, phenothiazine, or combinations thereof.

7. The method of claim 1, wherein the one or more multifunctional acrylate or methacrylate monomers are selected from a cyclic ether acrylate, a cyclic ether methacrylate, alkoxy acrylates, alkoxy diacrylates, alkoxy methacrylates, alkoxy dimethacrylates, and combinations thereof.

8. The method of claim 7, wherein the one or more multifunctional acrylate or methacrylate monomers are selected from 1,4-butanediol diacrylate or dimethacrylate, tetrahydrofurfuryl acrylate or methacrylate, and combinations thereof.

9. The method of claim 1, wherein the initiator is a peroxide.

10. The method of claim 9, wherein the initiator is benzoyl peroxide, methyl ethyl ketone peroxide, cumene hydro peroxide, or combinations thereof.

11. The method of claim 1, comprising 10 to 30 weight percent silicone