Test Methods to Evaluate Thermal Properties and Performance of Insulative Coatings

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Document History

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Foreword

The primary intent of this standard is to specify test conditions that would give a baseline evaluation – one that would allow direct performance comparisons between different insulative coatings. This standard is designed to have practical test procedures with limited test conditions. It also includes Appendix A (nonmandatory) which describes hot plate designs, and Appendix B (nonmandatory) which describes an alternative thermal conductivity test design.

Insulative coatings are often used to provide thermal insulation and personnel protection against burns to skin and to improve process stability during rapid changes in weather conditions. Since they are liquid coatings, they can easily be applied onto irregular-shaped objects used in hot services. In combination with an anticorrosive primer, these coatings also provide corrosion protection and minimize corrosion under insulation (CUI), because the insulative coating bonds directly to the primed metallic substrate. As a result, insulative coatings do not have air gaps between the substrate and the coating where water can ingress and accelerate corrosion rates as happens with traditional insulation materials.

There are other commercially available types of insulative coatings such as viscoelastic tapes that may have insulation properties and if so, can be used for personnel protection, but it is difficult to test these other types with the methods used in this standard. The manufacturers of these coatings may have alternative test data and can describe certain benefits for the viscoelastic tapes. Users may want to review alternative insulative coatings to see if these coatings have applications that fit their needs.

This standard introduces new test methods to determine if, and at what rate, an insulative coating's properties deteriorate with thermal aging. Test methods are given for both organic- and inorganic-based coatings.

The maximum service temperature limit for the organic-based coatings is approximately 177 °C (350 °F). For inorganic coatings, the limit is significantly higher. Thicknesses can range from 1 to 5 mm (40 to 200 mils) for organic coatings and may be significantly thicker for inorganic coatings.

Scope

The purpose of this standard test method is to specify test methods and test conditions used to evaluate thermal properties, insulation values, and performance, before and after thermal aging, for insulative coatings. This test method is intended for use by facility owners, engineers, health and safety specialists, coatings manufacturers, and other interested parties.

Rationale

Numerous test methods have been used to characterize the performance of insulative coatings in the past. Some of these test methods are from test methods used for traditional bulk insulation products and from other test methods for coatings in atmospheric services at ambient temperatures. Their relevance to insulative coatings may be questionable. It has been difficult for facility owners and engineers to compare coating performance using these different test methods, which provide no standardization of the test conditions. A standardized test method can validate the thermal characteristics of these coatings and enable direct comparison of the coating's performance. This standard selects only those test methods that are most relevant to insulative coatings in high-temperature services. In this latest version of this revised standard, there are numerous grammatical revisions to the text and revisions to the text to make the procedures more clearly stated. Certain paragraphs were reordered to show more clarity as to when certain procedures are performed. New learnings from working with the first version of this standard have led to the elimination of several tests. There were also minor modifications to a few procedures to make them more accurate or to simplify the procedure.