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IEEE Guide for the Application, Maintenance, and Evaluation of Room Temperature Vulcanizing (RTV) Silicone Rubber Coatings for Outdoor Ceramic Insulators

IEEE Dielectrics and Electrical Insulation Society

Sponsored by the
Outdoor Service Environment Committee



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Abstract: Various important aspects that are needed for satisfactory long-term performance of High-Voltage Insulator Coatings (HVIC) are presented in this guide. Various possible application scenarios, maintenance issues on coated insulators, factors affecting long-term performance, the question of aging, laboratory accelerated tests, and functional outdoor evaluation are described.

Keywords: aging, evaluation, hydrophobicity, HVIC

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Introduction

[This introduction is not part of IEEE Std 1523-2002, IEEE Guide for the Application, Maintenance, and Evaluation of Room Temperature Vulcanizing (RTV) Silicone Rubber Coatings for Outdoor Ceramic Insulators.]

The problem of outdoor insulator flashover due to contamination has existed as long as outdoor insulation itself. Insulator flashovers result in power outages that are expensive and hence undesirable. It was understood that in order to prevent flashover, the leakage current must be minimized. Room temperature vulcan (RTV) coatings minimize leakage current by preventing water filming on the insulator surface.

The use of RTV coatings began on a trial basis since the 1970s. Large-scale application of the coatings began in the 1980s. User experience of RTV coatings has been highly successful. But it must be mentioned that for any specific application, judgment and experience are required to analyze and balance the many characteristics, which are discussed to obtain satisfactory performance and reliability.

The work toward this guide began in the early 1990s. Round robin tests were performed in several laboratories. Concurrently, input regarding user experience was solicited.

IEEE Std 957™-1995^a deals with some aspects of RTV coatings. This guide aspires to provide more details and information on the subject of RTV coatings.

Participants

At the time this guide was completed, the Outdoor Service Environment Committee S-32-3 had the following membership:

R. S. Gorur, *Chair*

T. Biakek
E. A. Cherney
J. Goudie

R. Harmon
R. Hartings
J. Hocheimer
T. Orbeck

D. Shead
R. Tay
R. Wagner

The following members of the balloting committee voted on this guide. Balloters may have voted for approval, disapproval, or abstention.

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Thomas Barnes
Sudhakar Cherukupalli
Robert Christman
Tommy Cooper
Ronald Daubert
Randall Dotson
Franklin Emery
Gary Engmann

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Donald Laird
Albert Livshitz
Gregory Luri
Keith Malmedal
William McDermid
Susan McNelly
Peter Meyer

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Gary Michel
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^aInformation on references can be found in Clause 2.

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Lowell G. Johnson
Joseph L. Koepfinger*

Peter H. Lips
Nader Mehravari
Daleep C. Mohla
William J. Moylan
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Geoffrey O. Thompson
Howard L. Wolfman
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IEEE Guide for the Application, Maintenance, and Evaluation of Room Temperature Vulcanizing (RTV) Silicone Rubber Coatings for Outdoor Ceramic Insulators

1. Overview

1.1 Scope

This guide is based on the knowledge and experience of manufacturers, users, and researchers of room temperature vulcanizing (RTV) silicone rubber coatings that are used to improve the contamination performance of outdoor high-voltage (HV) insulators. This guide discusses various important aspects that are needed for satisfactory long-term performance of high-voltage insulator coatings (HVIC)—namely, various possible application scenarios, maintenance issues on coated insulators, factors affecting long-term performance, the question of aging, laboratory accelerated tests, and functional outdoor evaluation. However, it must be mentioned that for any specific application, judgment, and experience are required to analyze and balance the many characteristics, which are discussed to obtain satisfactory performance and reliability.

1.2 Purpose

This guide is intended for the use of RTV coatings on ceramic and glass insulators.

1.3 Applications

This guide is specific enough to be applicable to porcelain and glass insulators in stations as well as transmission and distribution lines.

RTV coatings are also in use for mitigating animal-induced outages in stations. The coatings used, and the important aspects, may be different than those used for insulator contamination performance improvement. The manufacturer should be consulted prior to use of HV insulator coatings for animal protection.

2. References

This guide should be used in conjunction with the following publications. When the following publications are superseded by an approved revision, the revision shall apply.

ASTM D 149-1997, Standard Test Method for Dielectric Breakdown Voltage and Dielectric Strength of Solid Electrical Insulating Materials at Commercial Power Frequencies.¹

ASTM D 150-1998, Standard Test Methods for AC Loss Characteristics and Permittivity (Dielectric Constant) of Solid Electrical Insulation.

ASTM D 257-1999, Standard Test Method for DC Resistance or Conductance of Insulating Materials.

ASTM D 495-1999, Standard Test Method for High-Voltage, Low-Current, Dry Arc Resistance of Solid Electrical Insulation.

ASTM D 2132-1998, Standard Test Method for Dust-and-Fog Tracking and Erosion Resistance of Electrical Insulating Materials.

ASTM D 2303-1997, Standard Test Methods for Liquid-Contaminant, Inclined-Plane Tracking and Erosion of Insulating Materials.

IEEE Std 957™-1995, Guide for Cleaning Insulators.^{2,3}

3. Definitions

For the purposes of this guide, the following terms and definitions apply. IEEE 100™, *The Authoritative Dictionary of IEEE Standards Terms*, Seventh Edition [B2]⁴ should be referenced for terms not defined in this clause.

3.1 erosion: An irreversible and nonconducting degradation of the RTV coating that occurs by loss of material. This can be uniform or localized. Shallow surface traces can occur on coatings. (See IEC 61109-1992 [B1].)

3.2 hydrolysis: Depolymerization of the material due to the interaction of the ions of water.

3.3 room temperature vulcanizing silicone rubber: A silicone elastomer formed by vulcanization at room temperature of a liquid silicone polymer.

3.4 tracking: An irreversible degradation by formation of paths starting and developing on the surface of the RTV coating. These paths can be conductive even under dry conditions. Tracking can occur on surfaces in contact with air and on the interfaces between different insulating materials. (See IEC 61109-1992 [B1].)

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⁴The numbers in brackets correspond with those in the bibliography in Annex B.