Technical Report

ISO/TR 20470-1

New weatherable topcoats as part of an associated protective coating system —

Part 1: Weathering of FEVE type fluoropolymer topcoat

Nouvelles couches de finition résistantes aux intempéries faisant partie d'un système de revêtement protecteur associé —

Partie 1: Vieillissement aux intempéries de la couche de finition en fluoropolymère de type FEVE

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Foreword

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This document was prepared by Technical Committee ISO/TC 35, *Paints and varnishes*, Subcommittee SC 14, *Protective paint systems for steel structures*.

Any feedback or questions on this document should be directed to the user's national standards body. A complete listing of these bodies can be found at www.iso.org/members.html.

Introduction

In ISO 12944-5:2019, 6.2.5, fluoroethylene vinyl ether (FEVE) fluoropolymer topcoats are characterized as a specialized type of polyurethane based on fluoropolymers. This document describes the characteristics of the fluoropolymer topcoats with the intention of helping users understand both their advantages and limitations. Joint research on enhancing the weatherability and durability for a variety of coatings was launched in 1983 managed by the Public Works Research Institute of the Ministry of Construction in Japan and was continued until the publication of this document. The fluoropolymer topcoat systems were included in the joint research and results were obtained on the durability and weatherability over 30 years. These fluoropolymer topcoats systems were reported at several international conferences.[1]-[9] This document incorporates valuable findings from the joint research on weathering tests conducted over the past 30 years, which are beneficial for users. Moreover, users are encouraged to contribute their own results to enhance the comprehensiveness of this document. FEVE type waterborne fluoropolymer topcoats and their coating systems have been developed and used in the market since around 2015, but long-term outdoor weathering data as has been obtained for the solvent borne type have not been achieved at present.

This document contains weathering performance data such as the rate of gloss retention and chalking resulting in film thickness loss of the topcoat system, along with chemical analysis data focusing on the coating film deterioration of fluoropolymer topcoat. All data has been obtained from the outdoor exposure testing. The chemical analysis relating to coating film deterioration was conducted using FTIR spectroscopy, covering analysis of both the surface and the cross-section (depth direction from the surface).

Users of this document can use the results of the long-term outdoor exposure test to predict the durability of the coating system.

Finally, this document points to the technological development of coating materials with state-of-the-art weathering performance in future, such as extremely slow chalking deterioration. This coating can be the standard reference for observing and evaluating short-, medium- and long- term weatherable coatings using the outdoor exposure data of these topcoats.

By using the data in this document, the real time durability of the coating film can be efficiently estimated using a short-term exposure test or an accelerated weathering test, or both.

New weatherable topcoats as part of an associated protective coating system —

Part 1:
Weathering of FEVE type fluoropolymer topcoat

1 Scope

This document describes the basic characteristics of fluoroethylene vinyl ether copolymer (FEVE) type fluoropolymer topcoats and their coating systems. Information on the weathering performance of the fluoropolymer topcoats and associated coating systems for over 30 years is also provided.[1],[4]-[12]

This document covers:

— weathering data of FT (FEVE fluoropolymer topcoat);

— chemical analysis of outdoor exposed coated panels focusing on the paint surface and their cross-sections.

This document does not include FEVE type waterborne fluoropolymer topcoats and their coating systems.

2 Normative references

There are no normative references in this document.

3 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

ISO and IEC maintain terminology databases for use in standardization at the following addresses:

— ISO Online browsing platform: available at https://www.iso.org/obp

— IEC Electropedia: available at https://www.electropedia.org/

3.1
imaging infrared
imaging IR
method of measuring and imaging the in-plane distribution of functional groups specific to a compound using a detector composed of multiple elements

Note 1 to entry: Since it is possible to measure the molecular structure over a wide area, imaging IR is effective for investigating the cross-sectional structure of surface deterioration due to ultraviolet irradiation and the cross-sectional layer structure of multilayer films.

3.2
fluoroethylene vinyl ether copolymer
FEVE
resin which consist of fluoro-olefin units, various hydrocarbon vinyl ether units and has pendant OH-groups

Note 1 to entry: Along the polymer chain each vinyl ether unit alternates with fluoro-olefine unit. This sequence is responsible for weather resistance.