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**NATIONAL STANDARD OF THE
PEOPLE'S REPUBLIC OF CHINA**

GB/Z 28820.4-2022

**Long-term radiation ageing in polymers - Part 4: Effects of
different temperatures and dose rates under radiation
conditions**

Issued on: July 11, 2022

Implemented on: February 1, 2023

**Issued by: State Administration for Market Regulation, China National
Standardization Administration**

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foreword

This document is in accordance with the provisions of GB/T 1.1-2020 "Guidelines for Standardization Work Part 1. Structure and Drafting Rules of Standardization Documents" drafted.

This document is part 4 of GB /Z 28820 "Long-term Radiation Aging of Polymers". GB /Z 28820 has published the following parts.

- Part 1. Techniques for monitoring diffusion-limited oxidation;
- Part 2. Procedures for predicting aging at low dose rates;
- Part 3. In-service monitoring procedures for low-voltage cable materials;
- Part 4. Effects of different temperatures and dose rates under radiation conditions.

This document is identical to IEC /T R61244-4.2019 "Determination of long-term radiation aging of polymers - Part 4. Different temperatures under radiation conditions"

Influence of Intensity and Dose Rate", the document type is adjusted from IEC technical report to my country's national standardization guiding technical document.

The following minimal editorial changes have been made to this document.

- In order to harmonize with existing standards, change the name of the document to "Long-term Radiation Aging of Polymers - Part 4. Different Temperatures under Radiation Conditions

and Dose Rate Effects."

Please note that some content of this document may be patented. The issuing agency of this document assumes no responsibility for identifying patents.

Introduction

IEC 60216 (all parts) and IEC 60544 (all parts) propose testing electrical insulating materials for accelerated thermal aging and radiation, respectively

Aging reference guide. In practical applications of electrical equipment, it is usually necessary to consider the effects of temperature and different radiation intensities at the same time.

CIGREWG1.42 provides the damage data of cables and their insulating materials under the simultaneous application of heat and radiation. Currently working

A wide variety of different materials are used in the industry, but this document only studies cross-linked polyethylene (XLPE), ethylene propylene rubber (EPR), silicone rubber (SIR) and

Polyvinyl chloride (PVC) is a commonly used material. Using test data from these materials, nuclear power plant operators can meet regulatory

Requirements defined under the "Long Service" framework and indicate that most insulation materials that are 30 to 40 years old are in good condition. also,

Materials were also obtained from in-service equipment as specimens and compared with test results on unaged and artificially aged reference specimens.

The main purpose of the nuclear power industry is to obtain reliable residual life values for in-service insulating materials and equipment connections composed of these materials. but

With the appearance of in-service aging of insulating materials, it is necessary to study more deviations from the estimated values of accelerated aging tests. For better determination of insulation

For the degradation process of materials, it is necessary to have a broader understanding of the degradation and interrelated synergistic effects of materials under the action of low-intensity heat and radiation.

GB /Z 28820.4 aims to summarize the results and update the literature references in CIGREWG1.42 in some areas, proposing thermal aging-

Radiation aging multi-factor assessment procedure.

At present, GB /Z 28820 consists of 4 parts.

--- Part 1. Techniques for monitoring diffusion-limited oxidation. The aim is to propose techniques for monitoring diffusion-limited oxidation.

--- Part 2. Procedures for predicting aging at low dose rates. The purpose is to propose a prediction of polymer aging under low dose rate radiation

program.

--- Part 3. In-service monitoring procedures for low-voltage cable materials. The purpose is to summarize the techniques for monitoring the in-service degradation of low-voltage cable materials.

--- Part 4. Effects of different temperatures and dose rates under radiation conditions. The purpose is to summarize the effect of temperature and dose rate on polymer materials

Effects of Radiation Aging.

Long-term radiation aging of polymers

Part 4. Different temperatures and

The effect of dose rate

1 Scope

This document provides an overview of the evaluation/validation of Electrical Insulation Materials (EIM) and Electrical Insulation Systems (EIS) used in equipment exposed to ionizing radiation.

General guide. In addition to sensors, drives/motors, and connectors and terminals, cables are typical electrical equipment for EIM and EIS applications, including

Including low-voltage power cables, control cables and instrument cables, etc. The cable design is simple and ideal for studying the degradation process of EIM and EIS.

These findings can also be applied to electrical equipment such as sensors, drives/motors, and connectors and terminals.

This document applies to evaluation/validation procedures that simulate the simultaneous action of different temperatures and radiation intensities.

This document does not apply to detailed test procedures for characteristic test methods.

Note 1. When using this document to evaluate some specific products, it may be necessary to use other procedures related to that product.

Note 2. The procedures specified in this document contain certain emerging technologies, so in the evaluation process, the experience gained and specific conditions can be taken into account

in.

2 Normative references

The contents of the following documents constitute essential provisions of this document through normative references in the text. Among them, dated citations

documents, only the version corresponding to that date applies to this document; for undated references, the latest edition (including all amendments) applies to this document.

NOTE. GB/T 26168 (all parts) Electrical insulating materials determine the effects of ionizing radiation [IEC 60544 (all parts)]

ageing in polymers)

1) IEC /T S61244-3:2005 has been repealed.

Note. GB /Z 28820 (all parts) long-term radiation aging of polymers [IEC /T S61244 (all parts)]

3.1 Terms and Definitions

Terms and definitions defined in IEC /T S61244 (all parts) and IEC 60544 (all parts) apply to this document.

Terms and definitions used in this document from ISO and IEC are available at.

3.2 Abbreviations

The following abbreviations apply to this document.