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DRS 300

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Epoxy resin for paints — Specification

ICS 87.040

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In order to match with technological development and to keep continuous progress in industries, standards are subject to periodic review. Users shall ascertain that they are in possession of the latest edition

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Foreword

Rwanda Standards are prepared by Technical Committees and approved by Rwanda Standards Board (RSB) Board of Directors in accordance with the procedures of RSB, in compliance with Annex 3 of the WTO/TBT agreement on the preparation, adoption and application of standards.

The main task of technical committees is to prepare national standards. Final Draft Rwanda Standards adopted by Technical committees are ratified by members of RSB Board of Directors for publication and gazettment as Rwanda Standards.

DRS 300 was prepared by Technical Committee RSB/TC 056, *Paints, Varnishes, Adhesives and Related Products.*

In the preparation of this standard, reference was made to the following standard:

1) IS 14925: Epoxy resin for paints — Specification

The assistance derived from the above source is hereby acknowledged with thanks.

This second edition cancels and replaces the first edition (RS 300: 2016), which has been technically revised.

Committee membership

The following organizations were represented on the Technical Committee on *Paints, Varnishes, Adhesives and Related Products* (RSB/TC 056) in the preparation of this standard.

Star Construction and Consultancy Ltd

Rwanda Inspectorate, Competition and Consumer Protection Authority (RICA)

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Introduction

Epoxy is the family of basic components or cured end products of epoxy resins. Epoxy resins, also known as polyepoxides, are a class of reactive prepolymers and polymers which contain epoxide groups.

Two-part epoxy coatings were developed for heavy duty service on metal substrates and use less energy than heat-cured powder coatings. These systems provide a tough, protective coating with excellent hardness. One part epoxy coatings are formulated as an emulsion in water, and can be cleaned up without solvents. Epoxy coatings are often used in industrial and automotive applications since they are more heat resistant than latex-based and alkyd-based paints. Epoxy paints tend to deteriorate, known as "chalking out", due to UV exposure.

Epoxy resin for paints — Specification

1 Scope

This Draft Rwanda Standard specifies the requirements, sampling and test methods for epoxy resin used in paint industry.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO 4618, *Paints and varnishes — Terms and definitions*

ISO 4630, *Clear liquids — Estimation of colour by the Gardner colour scale*

ISO 3219-1, *Rheology — Part 1: Vocabulary and symbols for rotational and oscillatory rheometry*

ISO 3219-2, *Rheology — Part 2: General principles of rotational and oscillatory rheometry*

ISO 4625-1, *Binders for paints and varnishes — Determination of softening point — Part 1: Ring-and-ball method*

ISO 4625-2, *Binders for paints and varnishes — Determination of softening point — Part 2: Cup-and-ball method*

ISO 3001, *Plastics — Epoxy compounds — Determination of epoxy equivalent*

ISO 7142, *Binders for paints and varnishes — Epoxy resins — General methods of test*

RS OIML R 87, *Quantity of product in pre-packages*

ISO 15528, *Paints, varnishes and raw materials for paints and varnishes — Sampling*

3 Terms and definitions

For the purposes of this standard, the terms and definitions given in ISO 4618 and the following apply.

3.1

epoxy resin

synthetic resin containing epoxide groups and in which a final polymer is formed as a result of reaction taking place substantially at the epoxide groups

3.2

ambient temperature

temperature between 21 °C and 38 °C

3.3

epoxide equivalent

mass of an epoxide compound, in grams, which contains one mole of epoxide group

3.4

colour

aspect of the appearance of objects which depends up-on the spectral composition of light reaching the retina of the eye and upon its temporal and spatial distribution

4 Requirements

4.1 General requirements

4.1.1 The epoxy resins shall be a condensation product of epichlorohydrin and bisphenol A in alkaline condition, which leads to formation of epoxy group containing resins. These resins shall have different molecular weight or epoxy equivalent weight depending on stoichiometric ratio of above mentioned reactants. The manufacturer shall declare molecular distribution and average molecular weight.

4.1.2 Depending upon the applications in paint system epoxy resins shall be classified into three types as detailed in Table 1 based on average molecular weight or epoxy equivalent weight when determined through the method specified in Annex A, along with physical state of resin.

Table 1 – Physical state of resin

Types	Physical state	Average molecular weight	Epoxy equivalent weight	Test method
Type A	Liquid	360 – 380	180 – 200	Annex A
Type B	Low molecular weight, solid			
	Grade 1	900	425 – 550	
	Grade 2	1 400	850 – 1 000	
Type C	High molecular weight, solid			
	Grade 1	2 900	1 700 – 2 300	
	Grade 2	3 750	2 400 – 3 500	

4.2 Specific requirements

4.2.1 Epoxy resin shall comply with the requirements specified in Table 2.

Table 2 – Requirements for epoxy resins

S/N	Characteristic	Type A	Type B	Type C	Test

				Grade 1	Grade 2	Grade 1	Grade 2	method
1	Colour (on 'Gardener" scale), max.			3	4	4	4	6	ISO 4630
2	Viscosity	a	As such at 25 °C ± 0.05 °C (cps)	8 000 – 15 000				ISO 3219-1 & ISO 3219-2
		b	40% in butyl carbitol at 25 °C ± 0.5 °C (cps)	80 – 170		470 – 750	1 600 – 3 400	4 000 – 11 000	
		c	50% in 1:1 mixture of O.Xylene/D.A.A at 25 °C ± 0.5 °C (cps)	100 – 150				
3	Softening point (ball and ring), °C			60 – 70		90 – 100	117 – 127	130 – 145	ISO 4625-1 ISO 4625-2
4	Epoxide equivalent, g/mole			180 – 200	425 – 550	850 – 1000	1700 – 2300	2400 – 3500	ISO 3001
5	Hydrolysable chlorine content, % by mass, max.			0.5	0.2	0.2	0.2	0.2	ISO 7142
6	Relative density (at 27 °C ± 12 °C)			1.15 – 1.20					

4.2.2 Storage condition

The epoxy resins, when stored in normal condition at the ambient temperature, shall retain its property for at least 12 months from the date of manufacture as prescribed in table 2.

5 Packaging and labelling

5.1 Packaging

5.1.1 The epoxy resins shall be packaged in sound, clean and dry containers that prevents it from deterioration during storage, transportation and normal handling.

5.1.2 The quantity of epoxy resins packaged in a container shall be in accordance with the requirements of RS OIML R 87.

5.2 Labelling

The container shall be labelled legibly and indelibly with the following information in any of the three languages officially accepted in the Republic of Rwanda namely: Kinyarwanda, French and English:

a) name of the product as: "Epoxy resins for paints";

b) "Type" and "Grade" of the product

c) name and address of the manufacturer and/or registered trader mark;

d) net content;

e) batch/lot number

f) month and year of manufacture;

g) instructions for use and disposal;

h) instruction for use; and

i) storage conditions

6 Sampling

Sampling shall be done in accordance with ISO 15528.

Annex A
(normative)

Determination of epoxide equivalent of epoxy compounds

A.1 Principle

A.1.1 Method A

Epoxide groups react with nascent hydrogen bromide produced by the action of a standard 0.1 mol/l solution of perchioric acid on tetraethyl ammonium bromide. The end-point in determined either by using crystal violet as indicator or, for dark-coloured products, by a potentiometric method. This method is recommended for normal reactive epoxy resin.

A.1.2 Method B

The amino nitrogen of the epoxyamine is titrated with a standard solution of perchloric acid. The value thus obtained is used as a correction in the calculation of the epoxide equivalent as obtained in Method A. this method is recommended for slow reactive epoxy resin.

NOTE Safety goggles and safety screen maybe used while carrying out tests through the above methods.

A.2 Reagents

Acetic acid, glacial

Acetic anhydride

Suitable solvent for solution of the sample – for example, chloroform, dibutyl phthalate, chlorobenzene

Potassium hydrogen phthalate – dry the potassium hydrogen phthalate for 2 h at 120 °C before use

Crystal violet, indicator solution – to 8.5 mL of a 70% (m/m) aqueous solution of perchloric acid, add 300 mL of acetic acid followed by 20 mL of acetic anhydride. Dilute to 1 L with acetic acid and mix thoroughly, standardize this solution by titrating it against 200 mg of potassium hydrogen phthalate dissolved in 50 mL of acetic acid, using the crystal violet indicator solution.

Use 4 to 6 drops of the crystal violet indicator solution and continue the titration until a stable green colour is obtained.

NOTE The temperature, t_s, of the solution of perch loric acid at the time of standardization. The concentration, C, in mol/l of the standard perchloric acid solution, is given by the formula $HClO_4$.

Bibliography

[1] IS 354, *Methods of sampling and test for resins for paints – Part 4: Special test methods for epoxy resins*, 1987

[2] IS 1070, *Reagent grade water — Specification (Third edition)*

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