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Plastics — Designation of copolymer resins of vinyl chloride

Matières plastiques — Désignation des résines de copolymères du chlorure de vinyle

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FOREWORD

ISO (the International Organization for Standardization) is a worldwide federation of national standards institutes (ISO Member Bodies). The work of developing International Standards is carried out through ISO Technical Committees. Every Member Body interested in a subject for which a Technical Committee has been set up has the right to be represented on that Committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work.

Draft International Standards adopted by the Technical Committees are circulated to the Member Bodies for approval before their acceptance as International Standards by the ISO Council.

International Standard ISO 2798 was drawn up by Technical Committee ISO/TC 61, *Plastics*, and circulated to the Member Bodies in July 1972.

It has been approved by the Member Bodies of the following countries :

Austria	Iran	Romania
Belgium	Ireland	South Africa, Rep. of
Brazil	Israel	Spain
Czechoslovakia	Italy	Sweden
Egypt, Arab Rep. of	Japan	Switzerland
France	Netherlands	Turkey
Germany	New Zealand	U.S.A.
Hungary	Poland	U.S.S.R.
India	Portugal	

No Member Body expressed disapproval of the document.

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0 INTRODUCTION

The method of designation of vinyl chloride copolymer resins set out in this International Standard is intended for use as the basis of a specification.

It is necessary to emphasise that some of the combinations of properties obtainable from the various classes in table 1 cannot be realised in practice.

1 SCOPE AND FIELD OF APPLICATION

This International Standard provides a means of designating vinyl chloride copolymer resins as a function of their structure, their chlorine content and their principal and secondary characteristics. It also provides for designating grades having characteristics important for particular end uses, including preparation of solutions.

2 REFERENCES

ISO/R 60, *Plastics — Determination of apparent density of moulding material that can be poured from a specified funnel.*

ISO 174, *Plastics — Determination of viscosity number of polyvinyl chloride resin in dilute solution.*

ISO/R 1043 and its Addenda 1 and 2, *Abbreviations (symbols) for plastics.*

ISO/R 1060, *Plastics — Designation of polyvinyl chloride resins.*

ISO/R 1158, *Plastics — Determination of chlorine in vinyl chloride polymers and copolymers.*

ISO/R 1269, *Plastics — PVC resins — Determination of volatile matter (including water).*

ISO/R 1270, *Plastics — PVC resins — Determination of ash and sulphated ash.*

ISO/R 1624, *Plastics — PVC resins — Sieve analysis in water.*

3 DEFINITION

For the purpose of this document the term **vinyl chloride copolymer resin** designates a resin in powder form, comprising a copolymer of vinyl chloride with one or more other monomers in which the vinyl chloride is the principal element.

This powder is intended to be used with necessary additives, to form a compound used in the fabrication of thermoplastic products.

It may also contain, in small quantities, non-polymerizable substances used during the process of polymerization (for example, emulsifiers or suspending agents, catalyst residues, etc.) or added deliberately in the course of polymerization and so being part of the polymerization system, in order to stabilize the resin (pre-stabilizers).

NOTE — The designation can also be used for homogeneous mixtures obtained by a mechanical process of mixing polyvinyl chloride with one or more polymers or copolymers of other monomers in which the polyvinyl chloride is the principal element, provided it is clearly indicated that this concerns mixtures.

TABLE 1

Designation order number	Classes										
	X	1	2	3	4	5	6	7	8	9	
I and II	PRINCIPAL CHARACTERISTICS										
	NS ⁴⁾	Viscosity number ^{2) 3)}		ml/g				ISO 174 ¹⁾			
		70	80	90
01	02	03	04	05	06	07	08	09			
	> 60 to 70	> 70 to 80	> 80 to 90	> 90 to 105	> 105 to 120	> 120 to 135	> 135 to 155	< 40	40 to 50	> 50 to 60	
III	PRINCIPAL CHARACTERISTICS										
NS ⁴⁾	Apparent bulk density (untamped)			g/ml				ISO/R 60 ¹⁾			
	< 0,25	0,25 to 0,35	> 0,35 to 0,45	> 0,45 to 0,55	> 0,55 to 0,65	> 0,65 to 0,75	> 0,75	...	...	...
IV	PRINCIPAL CHARACTERISTICS										
NS ⁴⁾	Granular composition %										
	- retained on 0,063 mm sieve										
	< 0,5	0,5 to 5	> 5 to 20	> 20 to 50	> 50 to 90	> 90	...	...	...	...
V	PRINCIPAL CHARACTERISTICS										
NS ⁴⁾	Granular composition %										
	- retained on 0,250 mm sieve										
	< 0,5	0,5 to 5	> 5 to 20	> 20 to 50	> 50 to 90	> 90	...	...	...	...
VI	PRINCIPAL CHARACTERISTICS										
NS ⁴⁾	Ash as sulphates %					ISO/R 1270 method B ¹⁾					
	< 0,20	0,20 to 0,40	> 0,40 to 0,80	> 0,80 to 1,60	> 1,60	...	...	...	...	...
VII	SECONDARY CHARACTERISTIC										
NS ⁴⁾	Volatile matters (including water) %										
	ISO/R 1269 ¹⁾										
	< 0,30	0,30 to 1	> 1 to 2	> 2 to 3	> 3 to 5	> 5	...	...	...	...

1) See clause 2.

2) K-values corresponding to these values can be found from the literature.

3) For viscosity number two figures are used to define the classes. For values above 60 ml/g the classes 01, 02, 03, 04, ... correspond exactly to the classes 1, 2, 3, 4, ... in ISO/R 1060. For values of 60 and below, three classes are included, namely 70, 80 and 90.

4) NS = not specified.

4 TYPES AND QUALITIES

The **type** of copolymer is defined by indications of its *chemical nature* and *structure*.

Each of the combinations of classes of characteristics indicated below, *obtainable in practice*, constitutes a **grade**.

5 DESIGNATION

5.1 Indication of type

The type of copolymer is designated by :

- the standard symbol of the name of the copolymer (ISO/R 1043 and its Addenda 1 and 2¹⁾);
- the letter specifying the structure of the copolymer²⁾, separated from the symbol by one space :
 - “c” for a random copolymer,
 - “g” for graft copolymer,
 - “b” for block copolymer;
- the value, in parentheses, of the chlorine content of the copolymer according to ISO/R 1158 for information purposes only.

5.2 List of characteristics used for the designation

5.2.1 Principal characteristics

- Viscosity number
- Apparent bulk density (untamped)
- Granular composition :
 - retained on 0,063 mm sieve
 - retained on 0,250 mm sieve
- Ash as sulphates

5.2.2 Secondary characteristic (for optional use)

- Volatile matters (including water)

5.3 Classification of values for each characteristic

The classes are described in table 1.

For each characteristic, the unit and test method to be used are indicated in addition to the values for the various classes.

Each characteristic in order of presentation in table 1 has a digit (two for viscosity number) corresponding to the class to which the resin belongs.

If one of the characteristics is not to be specified, the letter X is put in the corresponding column.

NOTES

1 The two digits for viscosity number are separated by a space from the figures in parentheses indicating the chlorine content and from the rest of the digits in the designation. (See examples in clause 6.)

2 Because of the normal variations which occur in the manufacture of resins, a product supposedly belonging to a given class for one characteristic may fall, in some cases, in the class immediately above or below that designated.

6 EXAMPLE OF DESIGNATION OF A RESIN

As an example for use of table 1, a resin of poly(vinyl chloride/vinyl acetate), a random copolymer with 50 % chlorine and having the following values for the various characteristics :

TABLE 2

Designating order number	Characteristic	Value	Class
I and II	a) Principal		
	Viscosity number	58 ml/g	90
III	Apparent bulk density (untamped)	0,72 g/ml	6
IV	Granular composition		
	– Retained on 0,063 mm sieve	70 %	5
	– Retained on 0,250 mm sieve	0 %	1
V	Ash as sulphates	0,10 %	1
VI	b) Secondary		
	Volatile matters (including water)	NS	X
VII			

would be designated by : VC/VAC c (50) 90 6511 X

or : VC/VAC c (50) 90 6511

7 PARTICULAR CHARACTERISTICS

Indications corresponding to particular characteristics, such as

- bulk density,
- powder flow,
- porosity,
- solubility in the usual solvents,
- thermal stability,
- impurities,
- melt flow index,

can be added but in this case the values and the test method must be by agreement between the purchaser and supplier.

1) ISO/R 1043 and Addenda 1 and 2 are not complete, but other Addenda are in the process of being prepared.

2) It is possible that the symbol gives an indication of the structure of the copolymer and therefore a letter would not be necessary.

ANNEX A

RELATIONSHIP BETWEEN THE AMOUNT OF CHLORINE AND THE AMOUNT OF VINYL CHLORIDE IN THE COPOLYMER

This relationship has no value except in the case of a copolymer based on ordinary vinyl chloride (not post-chlorinated) and having no other chlorinated polymer or additives.

Cl %	PVC %	Cl %	PVC %	Cl %	PVC %	Cl %	PVC %	Cl %	PVC %
18,5	32,6	26,5	46,7	34,5	60,8	42,5	74,9	50,5	89,0
19,0	33,5	27,0	47,6	35,0	61,7	43,0	75,8	51,0	89,9
19,5	34,4	27,5	48,5	35,5	62,6	43,5	76,7	51,5	90,8
20,0	35,3	28,0	49,4	36,0	63,5	44,0	77,6	52,0	91,7
20,5	36,1	28,5	50,2	36,5	64,3	44,5	78,4	52,5	92,5
21,0	37,0	29,0	51,1	37,0	65,2	45,0	79,3	53,0	93,4
21,5	37,9	29,5	52,0	37,5	66,1	45,5	80,2	53,5	94,3
22,0	38,8	30,0	52,9	38,0	67,0	46,0	81,1	54,0	95,2
22,5	39,7	30,5	53,8	38,5	67,9	46,5	82,0	54,5	96,1
23,0	40,5	31,0	54,6	39,0	68,8	47,0	82,9	55,0	97,0
23,5	41,4	31,5	55,5	39,5	69,6	47,5	83,7	55,5	97,8
24,0	42,3	32,0	56,4	40,0	70,5	48,0	84,6	56,0	98,7
24,5	43,2	32,5	57,3	40,5	71,4	48,5	85,5	56,5	99,6
25,0	44,1	33,0	58,2	41,0	72,3	49,0	86,4		
25,5	45,0	33,5	59,1	41,5	73,2	49,5	87,3	56,7	100,0
26,0	45,8	34,0	59,9	42,0	74,0	50,0	88,1		PVC resin

ANNEX B

It is recommended that in national standards, if possible, a list of commercially available combinations of characteristics of the various classes should be set up.