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Vitreous and porcelain enamels — Terminology —

Part 1: Terms and definitions

Emaux vitrifiés — Terminologie —

Partie 1: Termes et définitions

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Foreword

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A list of all parts in the ISO 19496 series can be found on the ISO website.

Vitreous and porcelain enamels — Terminology —

Part 1:
Terms and definitions

1 Scope

This document defines a number of terms relating to vitreous and porcelain enamels and their technology. This list is not complete and only comprises those terms for which the definition is considered necessary for correct and adequate understanding in order to clarify these processes.

The interpretations given are those corresponding to the practical usage in this field and they do not necessarily coincide with those used in other fields.

For purposes of clarification, the term "vitreous enamel", used throughout this document, is synonymous with "porcelain enamel", the term favoured in the United States and some other countries.

2 Normative references

There are no normative references in this document.

3 Terms and definitions

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

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

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

NOTE Annex A lists alternative terms and cross refers to primary terms used below.

3.1
abrasive blasting
process for *cleaning* (3.44) or finishing by means of an abrasive directed at high velocity against the work piece

3.2
abrasion resistance
degree of resistance of *vitreous enamel* (3.255) to be abraded by solid materials

3.3
acid resistance
degree of resistance of *vitreous enamel* (3.255) to attack by acidic corrosive chemicals

3.4
adherence
adhesion
<enamel-metallic substrate> degree of bonding between the fused *vitreous enamel* (3.255) and the metallic substrate

3.5
adherence of powder
ability of a vitreous enamel powder to remain attached by static attraction to a grounded *substrate* (3.242) before *firing* (3.111)

3.6
ageing
change in properties of vitreous enamel slips, powders, reagents, or steel with the lapse of time

3.7
air seal
air curtain
flow of pressurized air across the entrance and exit of a *continuous furnace* (3.53) that prevents heat escaping from the furnace but allows ware to pass through

3.8
alkali degreasing
removal of oil, grease, lubricants, and loose debris from the surface of the metallic substrate by immersion or spraying with an aqueous alkali degreaser in preparation for *vitreous enamelling* (3.256)

3.9
alkali resistance
degree of resistance of *vitreous enamel* (3.255) to attack by alkaline corrosive mediums

3.10
aluminium enamel
vitreous enamel (3.255) specifically formulated for application on aluminium substrates

3.11
anneal
annealing
thermal treatment of metals generally made by controlled heating and subsequent cooling

Note 1 to entry: Raw castings are heated in the range from 650 °C to 950 °C to relieve stresses and strains, burn off grease and in some cases to change the structure of the iron and in so doing improve the castings condition prior to coating with vitreous enamel.

3.12
anti-scale compound
agent that is applied to furnace tooling and other items to protect them from *scaling* (3.210) during *firing* (3.111)

3.13
back emission
back ionization
<electrostatic powder> defect often with the appearance of localized, very heavy *orange peel* (3.160), due to excessive charge build-up in the powder film resulting in electrical breakdown of air (i.e. back emission)

Note 1 to entry: The effect of the self-limiting characteristics of the electrostatic powder during application.

3.14
ball mill
ceramic or ceramic-lined rotating cylinder in which vitreous enamel materials are either wet or dry ground, generally using alumina, porcelain or steatite balls as grinding media

3.15
batch smelter
discontinuous smelter
smelter which is charged, fired, and discharged according to a predetermined periodic cycle

3.16
bead
defect resulting from accumulation of *vitreous enamel* (3.255) usually at the point where the enamel drains off the ware in *dipping* (3.78) (3.79)

3.17
beading
rim enamelling
application of ridge of *vitreous enamel* (3.255) along the edge or rim of ware

3.18
beading enamel
rim enamel
vitreous enamel (3.255) specifically formulated for *beading* (3.17)

3.19
biocide
anti-bacterial agent used to inhibit fermentation of organic *mill additions* (3.150) such as gums

3.20
bisque
dry unfired vitreous enamel coating

3.21
black specks
defect that appears as black particles at the surface of vitreous enamel coating

Note 1 to entry: See *boiling* (3.26) and *carbon boil* (3.34).

Note 2 to entry: This can be the result of reaction with the substrate or with contamination on the substrate surface.

3.22
blank
sized piece of untreated metal sheet that will be used in forming the finished article

3.23
blasting
process whereby solid metallic, mineral, synthetic resin, vegetable particles or water are projected at high velocity against a work piece for the purpose of *cleaning* (3.44), abrading or shot peening the surface

3.24
blister
defect that appears as a localized bubble under the surface of the fired *vitreous enamel* (3.255)

3.25
bloom
visual exudation or efflorescence on the vitreous enamel surface

Note 1 to entry: See *scumming* (3.212).

3.26
boiling
defect resembling areas of *ground-coat* (3.135) pull-through, *blisters* (3.24) and *pinholes* (3.169), visible after first cover-coat fire

Note 1 to entry: See *carbon boil* (3.34) and *black specks* (3.21).

Note 2 to entry: This can be the result of excessive ground-coat activity during cover-coat fire, as the ground-coat boils up through the cover-coat it may be accompanied by a release of gases.

3.27
bolt-hole brush
specially-designed round brush used to remove vitreous enamel bisque from in and around small openings in the ware

3.28
box furnace
furnace in which ware is fired according to a predetermined periodic cycle

3.29
break out
defect characterized by areas of *blisters* (3.24) having well-defined boundaries

3.30
bubble structure
size and spatial distribution of voids within the fired vitreous enamel layer

3.31
burn-off
defect that appears as a localized area of rough oxides erupting through the enamel coating

Note 1 to entry: This can be caused by too thin an application of enamel, allowing excessive oxidation of the metal substrate during firing, leading to super saturation of the enamel coating with metal oxides.

3.32
burning bar
burning point
burning tool
tool used to suspend or support ware during firing operations

3.33
button test
fusion button test
control test to determine the relative fusibility of vitreous enamel frit or powder

Note 1 to entry: See *fusion flow test* (3.126).

Note 2 to entry: The completed test specimen resembles a button.

3.34
carbon boil
defect resembling areas of *blisters* (3.24), *pinholes* (3.169), or *black specks* (3.21), visible in fired *vitreous enamel* (3.255)

Note 1 to entry: See *boiling* (3.26) and *black specks* (3.21).

Note 2 to entry: Result of the oxidation of carbides and free carbon at or near the surface of the steel substrate during firing, resulting in evolution of gasses.

3.35
cascading
<electrostatic powder> defect that starts with a few particles of powder detaching themselves after application and as they cascade down the ware they gather more and more powder leaving a trail of thinner and thinner coating

Note 1 to entry: Excess powder, inadequate powder adhesion and vibration contribute to this defect.

3.36
cast iron enamel
vitreous enamel (3.255) specifically formulated for application on cast iron substrate

3.37
cermet
ceramic-metal coating
mixture of one or more ceramic materials in combination with a metallic phase applied to a metallic substrate

3.38
chalkboard enamel
blackboard enamel
special type of matt vitreous enamel used to provide a writing surface for chalk

3.39
chalky surface
surface defect where the vitreous enamel surface has lost its *gloss* (3.131) and taken on a powdery appearance

Note 1 to entry: See *scumming* (3.212).

3.40
chemical resistance
degree of resistance of *vitreous enamel* (3.255) to attack by corrosive chemicals

3.41
chipping
defect characterized by fracturing and detachment of irregular enamel particles from the vitreous enamel surface

3.42
cleanability
relative ease with which soils or stains can be removed from a fused vitreous enamel surface

3.43
cleaner
pre-treatment solution, usually alkaline, used to remove oil, grease, lubricants, and loose debris from the surface of metal substrate in preparation for *vitreous enamelling* (3.256)

3.44
cleaning
degreasing
removal of foreign materials, such as abraded metallic particles from pressing or *blasting* (3.23), grease, oil, oxides, *scale* (3.209), rust, swarf, etc., from the surface

Note 1 to entry: See *vapour degreasing* (3.252).

3.45
clear frit
transparent frit
vitreous enamelling (3.256) frit that remains essentially transparent or non-opaque when fused

3.46
coefficient of expansion
rate at which a material will expand under the influence of increasing temperature

3.47
cold-rolled steel
low-carbon, cold-reduced and annealed sheet steel, not necessarily enamelling quality

3.48
colour matching
comparison of two or more samples of products that are notionally the same colour

3.49
colouring oxide
calcined mixture of inorganic material used as a *mill addition* (3.150) to impart colour to a *vitreous enamel* (3.255)

3.50
coloured frit
vitreous enamel frit containing a colorant in order to produce a strong colour in the fired *vitreous enamel* (3.255)

3.51
consistency
rheological properties of a vitreous enamel slip that control its *draining* (3.87), flowing, and spraying behaviour

3.52
continuity of coating
degree to which a *vitreous enamel* (3.255) is free from defects such as bare spots, *boiling* (3.26), *blisters* (3.24), or *copperheads* (3.58), etc., that could reduce its protective and/or its aesthetic properties

Note 1 to entry: See *discontinuity* (3.82).

3.53
continuous furnace
furnace through which ware is fed continuously and from which the fired product is discharged continuously

3.54
continuous smelter
smelter from which the molten product is discharged continuously

3.55
conventional enamelling
application of vitreous enamel ground coat(s) and cover coat(s), each one followed by a firing operation

3.56
cooling zone
exit part of a *continuous furnace* (3.53) in which the ware is allowed to cool after *firing* (3.111)

3.57
copper enamels
vitreous enamels (3.255) specifically formulated for application on copper substrate

3.58
copperheads
defect resembling small freckle or pimple-like reddish brown spots occurring in *ground-coats* (3.135), or direct-on *enamels* (3.255) on iron substrates, in principle in an isolated round *burn-off* (3.31)

3.59
cover coat enamel
vitreous enamel (3.255) with specific chemical, physical and/or aesthetic properties applied as either intermediate or final coat

3.60
covering power
degree to which a vitreous enamel coating obscures the underlying surface

3.61
crack
cracking
defect caused by laminar interruptions in the fused coating running vertical to the surface

Note 1 to entry: Cracking can also occur at different angles.

Note 2 to entry: The causes are mainly the result of mechanical or thermal tensile stresses within the enamel coating.

3.62
crawling
curling
incomplete formation of the enamel layer on the *substrate* (3.242) with the appearance of agglomerates or irregularly spaced islands in the *vitreous enamel* (3.255) during *firing* (3.111)

3.63
crazing
defect resembling a network of fine *cracks* (3.61) in the vitreous enamel coating

3.64
cross-bend test
determination of the resistance of *bisque* (3.20) or fused vitreous enamel coating to *cracking* (3.61) by progressively distorting the coated panels by bending

3.65
cup spray gun
cup-gun
spray gun (3.235) with a fluid container as an integral part

3.66
cupping
pouring of vitreous enamel slip over areas of a component during *draining* (3.87) to improve coverage in certain areas

3.67
curtains
defect with the appearance of a draped pattern of darkened areas that sometimes *blisters* (3.24)

Note 1 to entry: Curtains occur mainly in ground-coats and direct-on enamels but may also be seen in cover coats.

3.68
decal
transfer
design or wording printed on paper with *ceramic ink* (3.211) and transferred to a fired enamel surface and then refired to form an integral part of the vitreous enamel coating

3.69
decarburized steel
zero carbon steel
special type of steel sheet of extremely low carbon content

Note 1 to entry: This type of steel is suitable for direct-on white cover-coat application after acid pickle and nickel flash.

Note 2 to entry: Decarburized steel does not undergo a permanent phase change during firing hence it is sag resistant and is therefore suitable for large panels, etc.

3.70
de-beading
removal of excess vitreous enamel slip from the edge of dipped ware

3.71
decking
multiple layer loading of ware for drying and/or *firing* (3.111)

3.72
de-enamelling
removal of fired *vitreous enamel* (3.255) from the metallic substrate

3.73
de-setting agent
electrolytes that reduce the *viscosity* (3.254) of the vitreous enamel slip

3.74
delayed fish-scale
small half-moon shaped defects occurring in the vitreous enamelled surface which are not immediately apparent on cooling

Note 1 to entry: See *fish-scale* (3.116).

3.75
de-vitrification
change from the vitrified state to the crystalline state

Note 1 to entry: Some vitreous enamels will de-vitrify to produce dull lustre and opacity.

3.76
dimple
defect resembling a shallow depression in the vitreous enamel surface

3.77
dip weight
pick-up
plate weight
amount of *vitreous enamel* (3.255) retained on a test plate after *dipping* (3.78) (3.79), *flow coating* (3.119) or by *slushing* (3.226)

Note 1 to entry: This is specified as either dry weight or wet weight retained per unit area on a test plate.

3.78
dipping
swilling
<wet process> application of *vitreous enamel* (3.255) by immersing the component in a bath of vitreous enamel slip and subsequent removal of excess enamel by *draining* (3.87)

3.79
dipping
<dry process> application of *vitreous enamel* (3.255) in *dry process enamelling* (3.90) by briefly immersing the red hot component in powdered frit

3.80
direct fired furnace
open flame furnace

Note 1 to entry: The products of combustion come into contact with the ware during firing.

3.81
direct-on-enamelling
vitreous enamel coating, applied directly onto the metallic substrate and functioning as either a ground coat or as a finish coat

3.82
discontinuity
weakness within the vitreous enamel coating that is detected by spark testing

3.83
double draining
evidence of further flow having occurred after the apparent end of *draining* (3.87)

