

Because of Regulation (EC) No 1935/2004 on materials and articles intended to come into contact with food, most of the existing European and/or national regulations/laws on specific materials and articles intended to come into contact with foodstuffs are being updated.

Vitreous and Porcelain enamels are used as coating on steel/cast iron articles in order to protect corrosion of the metal underneath and to provide a closed, abrasion resistant and physiological safe surface that is perfectly fit to come into contact with foodstuffs. The main vitreous enameled articles that are used in the European community to come into contact with foodstuffs, are cook ware and baking trays in kitchen ovens.

In the past, vitreous and porcelain enamels have always been included in the group of materials called “ceramics”. This is very clear if we compare the existing ISO and CEN standards on release of lead and cadmium” for the different “ceramics” :

- there exist 4 different ISO standards <sup>(1)</sup> for “ceramics” and they all are referring to the same method and the same permissible limits. In the ISO 4531-1/2 this is also clearly mentioned : “...The permissible limits given in this International Standard are based on those WHO recommendations, because it was the sense of the WHO meeting that **the term "ceramic" includes ceramics, glass, vitreous enamels and glass ceramics....**”.
- EN 1388-1/2 is the CEN standard defining the reference method for determining the release of lead and cadmium from “silicate surfaces” : part 1 is for ceramic ware and part 2 for surfaces other than ceramic ware. In the foreword of both parts we read : “ .... This European

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<sup>1</sup> Four ISO standards on release of lead and cadmium of different “ceramics” are identical because the base material is the same.

ISO7086-1/2 : Glass hollowware in contact with food – Release of lead and cadmium  
part 1 : Test method  
part 2 : Permissible limits

ISO6486-1/2 : Ceramic ware, glass-ceramic ware and glass dinnerware in contact with food – Release of lead and cadmium  
Part 1 : Test method  
Part 2 : Permissible limits

ISO8391-1/2 : Ceramic cookware in contact with food – Release of lead and cadmium  
Part 1 : Method of test  
Part 2 : Permissible limits

ISO4531-1/2 : **Vitreous and porcelain enamels** – Release of lead and cadmium from “*vitreous*” ware in contact with food  
Part 1 : Method of test  
Part 2 : Permissible limits

standard has been prepared under a mandate given to CEN by the European Commission and the European Free Trade Association, and supports essential requirements of the EC Directive(s).” and in the introduction is stipulated that Directive 84/500/EEC annex I “Basic rules for determining the migration of lead and cadmium” is followed.

In the introduction of part 2, we read : “...Part 1 of this European Standard specifies the method of test for the determination of released lead and cadmium from ceramic surfaces. Because **existing national standards also have established that this method of test is applicable to glass, glass ceramic and vitreous enamel silicate surfaces** this part of the European Standard has been prepared also to specify tests applicable to such silicate surfaces... “.

During the last years however, there has been misunderstandings regarding Vitreous and Porcelain enamels. Often, vitreous enameled articles are treated as if they were metallic or plastic. The confusion has to do with following wrong assumptions:

1. Instead of “Vitreous and Porcelain enamels” often “enamels” is used, and enamels are organic coatings. But vitreous and porcelain enamels have nothing to do with paints. Paints are organic coatings which can contain inorganic components, but have no silicate structure. So, it is not correct to test vitreous enameled articles using regulations/laws for plastics.

The right English term is “vitreous enamels”, and in American English it is referred to as “porcelain Enamels”. The CEN standard EN 15826 gives the correct definition for vitreous enamel = porcelain enamel (USA, Canada) : “substantially vitreous, or glassy inorganic silica coating bonded to metallic substrate by fusion at a temperature above 480 °C. “, with a note that “ This coating is applied for protective functional and/or aesthetic purposes.”

2. Vitreous and porcelain enamels are used on metals and metal alloys and for that reason they are sometimes tested as if they were metallic surfaces. But the enamel coating is not metallic, it is ceramic and builds a closed, impermeable and abrasion resistant layer between the foodstuffs and the metal. So, it is not correct to test vitreous enameled articles using regulations/laws for metals. The European Directorate for the Quality of Medicines & HealthCare has also made clear that the “technical Guide on metals and alloys used in food contact materials and articles” of the EDQM/council of Europe does not deal with enamel. Limits for release of metals from vitreous and porcelain enamel are not described in this Technical guide. (see attachment)

That a vitreous and porcelain enamel coating is a closed impermeable and abrasion resistant layer can easily be proven with following facts:



- Bathtubs, silo panels and even chemical reactors are vitreous enameled. There is of course no contact between the chemical solutions in the reactor vessel and the bare steel used underneath the enamel coating because otherwise immediately corrosion would occur.
- An enamel layer is even not permeable for hydrogen! For this reason, only enameled steel can be enameled. These steel qualities have hydrogen traps in their microstructure. During the cooling down of steel, there always is oversaturated hydrogen that has to be removed out of the microstructure. This hydrogen normally escapes out of the surface. Because the enamel layer is impermeable, this is not possible. So, special enameled steel with hydrogen traps has to be used.
- An enamel layer has a Mohs Hardness  $\geq 5$ . This makes that under normal use of the vitreous enameled articles, there will be never be contact between the foodstuffs and the underneath metal.

For all above reasons, the European Enamel Authority is asking that the European Commission (DG SANCO) is incorporating vitreous and porcelain enamels in the scope of the discussion that has been started in 2011 on the revision of leachable metal limits in ceramics (currently defined in the Council Directive 84/500/EEC) and that the vitreous enameled articles sent to the European Reference Laboratory (EURL) are also been tested in the same way as the other ceramic articles. Only incorporating the vitreous enameled articles already in phase 1 of the planning, will stop the confusion in the market. It will make clear that the new directive for “ceramics” will be valid for all “ceramics”, including vitreous and porcelain enamels.

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