

Materials in contact with drinking water – the Swiss approach

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Abstract

In the Swiss legislation drinking water (from the waterworks on) is considered as foodstuff. Accordingly, products and materials in contact with drinking water are food contact materials that are regulated in a general manner in Art. 34 of the Swiss Ordinance on Foodstuffs and Utility Articles and more specifically in the Swiss Ordinance on Food Contact Materials. In the latter some requirements concerning metals are formulated as well as requirements for plastic materials including lists of authorised substances in combination with specific migration limits. However, so far no Swiss standards exist for materials in contact with drinking water that describe how to test for compliance with the legal requirements. Therefore, the Swiss Gas and Water Industry Association (SVGW) is developing an assessment scheme taking into account various European and international standards. At the conference the first results of the standardisation work is presented.

Legal background

In contrast to the situation in the EU, regulations on drinking water are part of the legislation on foodstuffs and utility articles in Switzerland. In article 4 of the Swiss Ordinance on Foodstuffs and Utility Articles (SR 817.02) drinking water is listed as permissible foodstuff. As a consequence of the fact, that drinking water is a foodstuff, materials and products coming into contact with drinking water are food contact materials and are regulated similarly to food packaging.

The general requirements for food contact materials are outlined in article 34 of the Swiss Ordinance on Foodstuffs and Utility Articles:

- food contact material should not release chemicals into the food at quantities that can harm human health
- food contact material should release chemicals into the food only at quantities that cannot be avoided technically
- food contact material should release chemicals into the food only at quantities that do not deteriorate the organoleptic characteristics

In addition, more detailed requirements for food contact materials, in particular for plastic materials, are specified in the Swiss Ordinance on Food Contact Materials (SR 817.023.21). Overall migration of any constituent of plastic materials is limited and may not exceed 60 mg/kg food. Moreover, the ordinance contains a list of substances (monomers and starting substances, additives) permitted to be used for the manufacture of plastics coming into contact with foodstuffs. However, this list encompasses far from all substances of relevance for organic materials in contact with drinking water, because it has been compiled for food contact materials (i.e. packaging materials). In particular, substances used for the production of coatings or elastomers are not well represented.

For some of these authorised substances a specific migration limit is defined, that is not allowed to be exceeded. In the ordinance, it is referred to methods how to test migration and compliance with the migrations limits set. However, these methods are not applicable to products in contact with drinking water such as pipes and fittings.

Finally, two articles deal with food contact materials made of metal. Accordingly, contact materials may not be made of lead and its alloys. Copper and its alloys may be used for drinking water pipes. Also galvanised pipes are permitted.

The approach of SVGW

For pipes, fittings and other products for drinking water installations a SVGW certificate can be requested. Basis for certification are mainly EN and ISO standards. However, only few standards exist for the hygienic assessment of materials and products in contact with drinking water. An European wide acceptance scheme to implement article 10 of the EU Drinking Water Directive (Council Directive 98/83/EC of 3 November 1998 on the quality of water intended for human consumption, DWD) which relates to the proper choice of materials and products is still missing. Nevertheless, several EU member states have developed national procedures and standards to fulfil the demands of article 10 of the DWD. In order to combine the requests of a high level of common health protection and the demands of a free market, SVGW does not attempt to formulate an additional national standard for testing and evaluating materials/products in contact with drinking water but rather to accept assessments based on the approaches implemented in other countries.

Evaluation of various national approaches

Plastic materials

Currently, for SVGW certification valuable test reports according to the German KTW-Guideline (Guideline for Hygienic Assessment of Organic Materials in Contact with Drinking Water; guideline dealing with formula-specific requirements and migration of compounds into drinking water) by the Federal Environmental Agency (Umweltbundesamt, UBA) as well as test reports according to the DVGW worksheet W 270 (Vermehrung von Mikroorganismen auf Werkstoffen für den Trinkwasserbereich – Prüfung und Bewertung; worksheet dealing with biofilm formation) have to be presented in order to demonstrate hygienic harmlessness. In

addition, the SVGW certification body is often confronted with test reports according to the following national standards:

- UK: BS 6920 (Suitability of non-metallic products for use in contact with water intended for human consumption with regard to their effect on the quality of the water.
- The Netherlands: Regeling materialien en chemicaliën drink- en warm tapwatervoorziening
- France: AFNOR XP P 41-250-1, -2 (Effet des matériaux sur la qualité des eaux destinées à la consommation humaine, matériaux organiques; Partie 1: Méthodes de mesures de paramètres organoleptiques et physico-chimiques; Partie 2: Méthode de mesure des micropolluants minéraux et organiques), AFNOR XP P 41-280 (Effet des matériaux sur la qualité des eaux destinées à la consommation humaine, objets constitués de plusieurs composants dont au moins un organique entrant au contact de l'eau – obtention et analyse de l'eau de migration)
- Austria: Önorm B 5014-1 (Sensorische und chemische Anforderungen und Prüfungen von Werkstoffen im Trinkwasserbereich; Teil 1: Organische Werkstoffe)
- USA: NSF/ANSI 61 - 2013 (Drinking Water System Components – Health effects)

In order to determine, whether it is possible to demonstrate the fulfilment of the Swiss regulations on foodstuffs with respect to the requirements for drinking water contact materials the test scope defined in these standards was evaluated in a first step. The results of this analysis are summarized in table 1.

Country	Germany	Austria	France	UK	NL	USA
Standards	UBA Leitlinien (i.e. KTW Leitlinie) DVGW worksheet W 270	ÖNorm B 5014-1 DVGW worksheet W 270	AFNOR XP P 41- 250-1/-2	BS 6920	Regeling materialen en chemicaliën drink- en warm tapwater- voorziening	NSF ANSI 61
Tests/Assessments:						
Evaluation of the formulation of a material/Comparison with a positive list	+	+	+	+	+	+
Migration tests & organoleptic analysis	+	+	+	+	+	-
Migration tests & analysis of TOC	+	+	+	-	+	-
Migration tests & analysis of compounds with SML	+	+	-	-	+	+
Migration & GC-MS analysis	-	-	+	+	-	+
Migration & toxicity testing	-	-	+	+	-	-
Migration tests & analysis of metallic compounds	-	-	+	+	-	+
Chlorine demand	-	+	+	-	-	-
Enhancement of microbial growth	+	+	-	+	+	-

Table 1: Comparison of various national approaches for hygienic assessment of materials in contact with drinking water

Secondly, a list of tests that have to be performed to show conformity with the Swiss legal requirements for materials in contact with drinking water was compiled:

- Comparison of the formulation with a positive list of authorised substances
- Migration tests combined with an organoleptic analysis of the migration waters
- Migration tests combined with the analysis of the TOC in the migration waters
- Migration tests and analysis of compounds for which a SML has been set
- Assessment of microbial growth enhancement of materials

In a third step it was determined which standards comprise a complete set of tests to show conformity with the Swiss requirements and in which cases additional testing has to be requested by the SVGW certification body. The results of this evaluation are summarised in table 2.

As the standards mentioned before are at least partly based on different testing methods it is difficult to compare the results. Moreover, most of the Swiss requirements are formulated in a general way without defining any limits that have to be met. Therefore, compliance with the requirements set in the national standards used for testing is accepted as basis for SVGW certification.

Requirement in CH	Germany	Austria	France	UK	NL	USA
Comparison of the formulation with a positive list	+	+	+	-	+	+
Migration tests + organoleptic analysis	+	+	+	+	+	-
Migration tests + analysis of TOC	+	+	+	+	+	-
Migration tests + analysis of compounds with SML	+	+	-	-	+	+
Enhancement of microbial growth	+	+	-	+	+	-

Table 2: Suitability of various national schemes for hygienic assessment to show fulfilment of the different requirements set by the Swiss food legislation

Metallic materials

As mentioned beforehand the Swiss Ordinance on Food Contact Materials includes two articles dealing with metallic utility articles. Moreover, for metallic materials in contact with drinking water, the Swiss ordinance on foreign substances and components (Fremd- und Inhaltsstoffverordnung, FIV; SR 817.021.23) is of relevance because it contains limit values for metal concentrations in drinking water. While antimony, lead, arsenic, cadmium and copper are regulated as in the DWD, no limit value is set for nickel.

So far, the standard DIN 50930-6:2001-8 (Korrosion metallischer Werkstoffe im Inneren von Rohrleitungen, Behältern und Apparaten bei Korrosionsbelastung durch Wasser. Teil 6: Beeinflussung der Trinkwasserbeschaffenheit) has been the basis for assessing metallic products for SVGW certification. The strict prohibition of lead

according to article 4 of the Swiss Ordinance on Food Contact Materials has not been followed. Accordingly, brass containing lead has been accepted.

Recently, the DIN standard has been replaced with a new version, i.e. DIN 50930-6:2013-10 (Korrosion der Metalle – Korrosion metallener Werkstoffe im Inneren von Rohrleitungen, Behältern und Apparaten bei Korrosionsbelastung durch Wässer – Teil 6: Bewertungsverfahren und Anforderungen hinsichtlich der hygienischen Eignung in Kontakt mit Trinkwasser). Among other things, this standard describes how to assess the results of the examination of a metallic material according to EN 15664-1 and -2 (Influence of metallic materials on water intended for human consumption – Dynamic rig test for assessment of metal release – Part 1: Design and operation, and Part 2: Test waters).

Moreover, after the Commission's withdrawal of its support for the European Acceptance Scheme (EAS) in 2006, the four EU Member States, Germany, France, the Netherlands and the United Kingdom Great Britain (4MS) have agreed on collaboration in the harmonization of tests for the hygienic suitability of products in contact with drinking-water. The 4MS formulated a procedure of acceptance of metallic materials that includes the before mentioned norms EN 15664-1 and -2. In addition, a Composition List of metallic materials accepted in all of the 4MS following this procedure has been published:

<http://www.umweltbundesamt.de/en/topics/water/drinking-water/distributing-drinking-water/approval-harmonization-4ms-initiative>.

In the future, this Composition List will be used as basis for certification of metallic products by the SVGW certification body.

Conclusions and outlook

It is not intended to develop a new national standards for the hygienic assessment of materials in contact with drinking water for Switzerland. On the contrary, testing based on various, already existing national standards (e.g. standards from Germany, Austria, France, UK, The Netherlands or the USA) will be accepted in order to show conformity with the requirements defined by Swiss food legislation. Clearly, additional

testing has to be requested if the standard used for testing does not enable the assessment of the fulfilment of all requirements set.

In a first step it has been focused on the development of an acceptance scheme for organic materials, in particular plastic materials, as well as metallic materials. Now it is planned to widen the range of materials and to formulate an approach for hygienic assessment of elastomers, lubricants and cementitious materials.