Update - Brussels, 24th September 2020

Statement for Synthetic Amorphous Silica in the context of the definition of 'nanomaterials' for cosmetic use in the European Union by the Association of Synthetic Amorphous Silica Producers (ASASP), a Sector Group of Cefic

The purpose of this statement is to provide the position of the Association of Synthetic Amorphous Silica Producers (ASASP) with respect to the substance Synthetic Amorphous Silica ("SAS") under the definition of "nanomaterial" provided in Regulation (EC) No 1223/2009 on cosmetic products ("the EU Cosmetics Regulation").

According to ASASP, SAS does not fulfil the criteria of insolubility or biopersistence included in the definition of nanomaterial provided by the EU Cosmetics Regulation and, therefore, should not be considered as a nanomaterial under that Regulation for the reasons explained below.

Background:
Currently two regulatory definitions of nanomaterial relating to cosmetics coexist in the EU:

- The definition provided by Commission Recommendation 2011/696/EU, now included in Commission Regulation (EU) 2018/1881 of 3 December 2018 amending Regulation (EC) No 1907/2006 of the European Parliament and of the Council on the Registration, Evaluation, Authorisation and Restriction of Chemicals (REACH) and Biocidal Products Regulation (BPR, Regulation (EU) 528/2012); and
- The specific definition included in the EU Cosmetics Regulation 1223/2009; superseding the EU Commission recommendation.

This ASASP statement refers to EU Cosmetics Regulation and the legally binding definition of a "nanomaterial" that it contains.

ASASP understands that Member States, EU agencies and economic operators are invited to use the definition of nanomaterial provided in the European Commission Recommendation. This, however, should not prejudge or reflect the scope of application of specific EU legislation providing additional requirements, nor constitute an obligation for the Commission to substitute the existing EU Cosmetics Regulation definition with the definition of the Commission Recommendation for "nanomaterial" in the Cosmetics Regulation. Specifically, Article 2(1)(k) of the EU Cosmetics Regulation defines "nanomaterial" as: "*an insoluble or biopersistent and intentionally manufactured material with one or more external dimensions, or an internal structure, on the scale from 1 to 100 nm*".

ASASP – Association of Synthetic Amorphous Silica Producers
Rue Belliard 40, Bte 15, 1040 Brussels Belgium
Tel. +32 2 436 94 53 pgi@cefic.be www.asasp.eu

However, the EU Cosmetics Regulation does not provide definitions for the two key terms included in the nanomaterial definition – "insoluble" and "biopersistent". Although not legally binding, objective criteria for insolubility and/or biopersistence of nanomaterials under use conditions have to be applied for interpretation.

ASASP recommends using the following objective criteria:

• **Insolubility**: Within the Classification, Labelling and Packaging (CLP) Regulation (EC) No. 1272/2008, "poorly soluble substances" are defined as substances of water solubility < 1 mg/l (Note 3 under Table 4.1.0 of the CLP Regulation). Furthermore, Cosmetics Europe (formerly Colipa)[1] and the European Federation for Cosmetic Ingredients (EFfCI)[2] have provided guidance defining the lower limit of substance solubility as 1 mg/l. In addition, the German Announcement Technische Bekanntmachung 527 on manufactured nanomaterials uses solubility in water as a pragmatic criterion to assess biopersistence. For the purposes of this Announcement, substances with a solubility in water of less than 100 mg/l are practically insoluble and therefore, biopersistent. As a consequence, substances with a water solubility above 100 mg/l are regarded as not insoluble.

Using the Enhanced OECD 105 Test Guideline 105 'Solubility for SAS' (see appendix 1), ASASP demonstrated in more than 70 tests that the solubility of all hydrophilic SAS products is 100 mg/L or higher. This includes SILICA (manufactured by the thermal process) and HYDRATED SILICA (manufactured by the wet production process). The test results concur with the published literature on the solubility of SAS, which is in the range of 100 to 150 mg/L. Based on the tests performed and results in comparison with the literature, and using the Pharmacopeia USP 38[3] document, it must be concluded that hydrophilic SAS is not insoluble in water and, therefore, is outside the scope of the nanomaterial definition provided in the Cosmetics Regulation (EC) No 1223/2009 Article 2 (1) (k).

Applying a modified method to accomplish sufficient material wetting, all hydrophobic SAS products analyzed so far exhibit solubility between 100 and 200 mg/L in 10% EtOH/water. It is expected that other products. not yet tested will also fit into that range. Thus, we conclude that the solubility of hydrophobic products currently on the market does not differ in respect to the silica from the results of hydrophilic SAS. Consequently, hydrophobic SAS products, used in cosmetic applications, do not meet the nanomaterial definition of the EU Cosmetics Regulation.

A summary of the enhanced OECD 105 Test Guideline 105 'Solubility for SAS' is given in appendix 1.

• **Biopersistence**: To the best of our knowledge, no definition for "biopersistence" is provided in other pieces of EU legislation. However, Annex XIII of Regulation (EC) No 1907/2006 concerning the Registration, Evaluation, Authorisation and Restriction of Chemicals (REACH) provides criteria for the identification of persistent, bioaccumulative and toxic substances, but specifies that it only applies to organic substances. Therefore, the criteria for "persistence" should not apply to inorganic chemical substances. Consequently,

by analogy and given the similarity of intent, since SAS is an inorganic chemical substance, it should not be considered as biopersistent. Per German Announcement Technische Bekanntmachung 527 on manufactured nanomaterials, substances with a solubility in water of higher than 100 mg/l are considered not insoluble and therefore, not biopersistent.

Additionally, the following points can be made:

♦ Today's production processes are based on technologies established in the 1940's. These processes have been optimized and improved since that time while maintaining the same technological principles.

♦ The aggregate is the smallest indivisible unit upon dispersion and typically has a size > 100 nm.

♦ SAS has been widely investigated over decades of its production and use in numerous toxicological and epidemiological studies. It is considered a non-hazardous substance (REACH updated Dossier 2019).

Therefore, we conclude that our SAS products, which have undergone appropriate assessment and approval, continue to be safe for approved use in Cosmetics products.

This statement represents the ASASP's current understanding of the Cosmetics Regulation. The Association will continue to monitor this evolving regulatory matter and will update this statement as appropriate.

References:

1 Colipa Discussion Paper on interpretation of the definition of the term "nanomaterial" according to the EU Cosmetic Regulation 1223/2009 (14-04-2011)

2 EFfCI Guidance Paper on Nanomaterials in Cosmetics (01-2012)

3 USP 38 General Notices and Requirements; Revision Bulletin Official April 1, 2015

Appendix 1: Summary of enhanced OECD 105 Test Guideline 105 'Solubility for SAS'

The enhanced OECD 105 Test Guideline 105 'Solubility for SAS' has been developed by SASforREACH Consortium and is the property of SASforREACH. Neither ASASP nor SASforREACH do *guarantee the same results will be obtained by others in other laboratories and we disclaim liability resulting from the use of the contents of this report.*

Water solubility is usually recognized as one of the relevant characterizers of nanomaterials. The OECD 105 protocol, which aims at defining the solubility of a substance for regulatory purposes such as REACH Regulation, has already shown some limitations when applied to materials at the nanoscale. SASforREACH consortium has developed an enhanced protocol specific to the proper assessment of Synthetic Amorphous Silica while highlighting the possible confounding effects associated to the evaluation of water solubility.

Untreated SAS

The measurement is conducted at fixed temperature, without pH adjustment and in saturation condition (50g/L) on the test substance. This method is dependent on the direct measurement of Silicon per ICP-OES (used for determination of the total SiO_2 content in the dissolved Si) and photometry (Used for determination of the dissolved ortho silicic acid [Limit of Quantification (LOQ) of the method is 0.1 mg/L silicon]). Different parameters including the primary particle size and specific surface area were tested to identify the relevant parameters on a collection of commercially relevant products.

The validation study was conducted at constant temperature and vessels were tempered before sampling to avoid any solvent driven effect. Six replicates were prepared at the same loading rate. All solutions were homogenized by using an ultrasonic bath for approximatively 1 minute. Different flasks were then set on the shaker for 24, 48 or 72h to obtain equilibrium. If equilibrium is not yet achieved, then an additional shaking time is added.

In addition, a Tyndall device was used for the determination of the concentration of undissolved particles in the samples [LOQ 4mg/l].

Using the Enhanced OECD 105 Test Guideline 'Solubility for SAS', it was demonstrated in more than 70 conducted tests that the solubility of all untreated SAS materials is 100 mg/L or higher. A model could be built based on the coherence of the generated data which could be used for estimation of the water solubility of new materials.

This enhanced solubility test for Synthetic Amorphous Silica (SAS) is based on the principles and in full compliance with the conditions laid down in the OECD 105 Water Solubility – Flask method adopted by the Council on July, 27th 1995.

References:

The study is conducted in accordance with the following guidelines:

- OECD Guidelines for the Testing of Chemicals, Method No. 105, adopted 27. July 1995: "Water Solubility"
- Council Regulation (EC) No. 440/2008 of 31. May 2008, Method A.6: "Water Solubility" (last updated by Reg. 260/2014)
- REACH Guidance Document "Guidance on information requirements and chemical safety assessment Chapter R.7a: Endpoint specific guidance" from August 2014

Treated (alkylsilylated) SAS

If surface-treated SAS can be wetted, it should exhibit a certain solubility in water. This hypothesis is supported by the literature on the degradation behavior of silicon dioxide in water and biological systems[1,2].

SASforREACH followed the recommendations of the NanoGenoTox protocol, i.e. pre-wetting the samples with ethanol, followed by dispersion in water. While the NanoGenoTox protocol proposes to use 0.5 % of ethanol, this is not sufficient for most hydrophobic SAS products. Instead a fixed concentration of 10 % ethanol was chosen.

This mixture was used for the determination of treated SAS solubility and the aforementioned *Enhanced* OECD 105 Test Guideline is being followed in all other aspects. For comparison, the solubility of hydrophilic SAS was determined at the same ethanol concentration and was found unsurprisingly slightly lower than in pure water. As access of the solvent to the Si-OH surface sterically hindered, it can take several weeks until the maximum solubility or a plateau is reached.

Several representative samples of alkylated hydrophobic SAS were tested.

Due to the variable nature of base materials, treatment agents, and process conditions there is no clear relationship with e.g. the BET surface area to be observed. However, all hydrophobic SAS products analyzed so far exhibit a solubility above 100mg/L in 10 % ethanol/water.

References:

The study is conducted in accordance with the following guidelines:

- OECD Guidelines for the Testing of Chemicals, Method No. 105, adopted 27. July 1995: “Water Solubility”
- NanoGenoTox Report: Standard operating procedures for characterization of the selected manufactured nanomaterials types, (2011); https://www.anses.fr/en/system/files/nanogenotox_deliverable_3.pdf

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[1] Croissant, J. G., et al. (2017). "Degradability and Clearance of Silicon, Organosilica, Silsesquioxane, Silica Mixed Oxide, and Mesoporous Silica Nanoparticles." Adv Mater 29(9): 1604634-n/a.

[2] Cauda, V., et al. (2010). "Bio-degradation study of colloidal mesoporous silica nanoparticles: Effect of surface functionalization with organo-silanes and poly(ethylene glycol)." Microporous and Mesoporous Materials 132(1): 60-71

About ASASP

The Association of Synthetic Amorphous Silica Producers is a sector group of the European Chemical Industry Council (Cefic) and represents the major producers of synthetic amorphous silica (SAS) in Europe. ASASP is a non-profit organisation established in 1992 dedicated to promoting the safe use and benefits of SAS to society. www.asasp.eu

The health and safety of employees, consumers and the wider community are of the upmost importance to ASASP members. ASASP continues to be convinced that based on the available information, the use of SAS in consumer products is considered safe.

Ends