Biocidal Products Committee (BPC)

Opinion on the application for approval of the active substance:

Silver zeolite

Product type: 4

ECHA/BPC/276/2021

Adopted

3 March 2021

Opinion of the Biocidal Products Committee

on the application for approval of the active substance silver zeolite for product type 4

In accordance with Article 89(1) of Regulation (EU) No 528/2012 of the European Parliament and of the Council 22 May 2012 concerning the making available on the market and use of biocidal products (BPR), the Biocidal Products Committee (BPC) has adopted this opinion on the non-approval in product type 4 of the following active substance:

Common name:	**Silver zeolite**
Chemical name:	**Silver zeolite (zeolite, LTA framework type[1], ion-exchanged with silver and ammonium ions)**
EC No.:	**not assigned**
CAS No.:	**130328-18-6[2]**

Existing active substance

This document presents the opinion adopted by the BPC, having regard to the conclusions of the evaluating Competent Authority. The assessment report, as a supporting document to the opinion, contains the detailed grounds for the opinion.

Process for the adoption of BPC opinions

Following the submission of an application by the European Silver Task Force on 17 December 2007, the evaluating Competent Authority Sweden submitted an assessment report and the conclusions of its evaluation to ECHA on 12 June 2017. In order to review the assessment report and the conclusions of the evaluating Competent Authority, the Agency organised consultations via the BPC (BPC-27 and BPC 38) and its Working Groups (WG V 2017). Revisions agreed upon were presented and the assessment report and the conclusions were amended accordingly.

[1] Linde Type A (framework type of the zeolite). The framework type is a crucial part of the identity. A silver zeolite with a different framework-type would not be considered the same substance.
[2] The CAS name is zeolites, synthetic, Ag. The entry in the CAS inventory is broader than the specified chemical name.

Adoption of the BPC opinion

Rapporteur: Sweden

The BPC opinion on the non-approval of the active substance silver zeolite in product type 4 was adopted on 3 March 2021.

The BPC opinion was adopted by consensus. The opinion is published on the ECHA webpage at: http://echa.europa.eu/regulations/biocidal-products-regulation/approval-of-active-substances/bpc-opinions-on-active-substance-approval.

Detailed BPC opinion and background

1. Overall conclusion

The overall conclusion of the BPC is that silver zeolite in product type (PT) 4 may not be approved. The detailed grounds for the overall conclusion are described in the assessment report.

2. BPC Opinion

2.1. BPC Conclusions of the evaluation

a) Presentation of the active substance including the classification and labelling of the active substance

This evaluation covers the use of silver zeolite in product type 4.

Silver zeolite (zeolite, LTA framework type, ion-exchanged with silver and ammonium ions) is an inorganic active substance, which cannot be analysed as the complete substance. The specification is thus based on the concentration ranges for major elements as well as maximum levels for elements regarded as impurities. A specification for the reference source is established. Arsenic (As) is regarded as a relevant impurity with a max level of 26 mg/kg.

The physico-chemical properties of the active substance and biocidal product have been evaluated and are deemed acceptable for the intended use, storage and transportation of the active substance and biocidal product.

Validated analytical methods are available for the technical material with respect to the major elements as well as the elements regarded as impurities (significant and relevant). Validated analytical monitoring methods for silver are available for the relevant matrices (soil, water and food).

In 2011, EFSA published a scientific opinion on the safety evaluation of the substance silver zeolite A (silver zinc sodium ammonium alumino silicate[3]), silver content 2–5% for use in food contact materials (EFSA, 2011[4]). In 2016, EFSA published its opinion regarding the re-evaluation of the safety of silver (E 174) when used as a food additive[5]. Requested by the Commission at BPC-27, a joint document[6] was prepared in the framework of the Memorandum of Understanding between ECHA and EFSA. This joint document is entitled: “Comparison of the evaluations performed on silver compounds used as biocidal active substances in food contact materials (FCM) by EFSA and ECHA”. The conclusions of this document are: i) in line with their respective legislations and guidance on data requirements, EFSA and ECHA performed two evaluations with different objectives and methodologies, noting however that the scenario to estimate the exposure on a daily basis is harmonised; and ii) as a result there are some differences (the scope of the assessment, the toxicological assessment based on a different dataset, the exposure assessment) between the opinions from EFSA and ECHA. However, the assessments are consistent within their respective regulatory framework.

A harmonised classification is not available for silver zeolite. The Swedish Chemicals Agency has submitted a proposal for harmonised classification and labelling on 3 July 2017.

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[3] This covers silver zinc zeolite, silver zeolite and silver copper zeolite applied for under the BPD.
[4] Scientific Opinion on the safety evaluation of the substance, silver zeolite A (silver zinc sodium ammonium alumino silicate), silver content 2–5%, for use in food contact materials. EFSA Journal 2011; 9(2):1999. 12 pp.
[5] EFSA Journal 2016;14(1):4364 http://onlinelibrary.wiley.com/doi/10.2903/j.efsa.2016.4364/epdf.
[6] The joint document is published on the ECHA webpage at: https://echa.europa.eu/regulations/biocidal-products-regulation/approval-of-active-substances/bpc-opinions-on-active-substance-approval.

The proposed classification and labelling for silver zeolite according to Regulation (EC) No 1272/2008 (CLP Regulation) is:

Proposed Classification according to the CLP Regulation	
Hazard Class and Category Codes	Repr. 2 Aquatic acute 1 Aquatic chronic 1
Labelling	
Pictogram codes	GHS08 GHS09
Signal Word	warning
Hazard Statement Codes	H361d (suspected of damaging the unborn child) H410 (very toxic to aquatic life with long lasting effects)
Specific Concentration limits, M-Factors	M = 100 for acute and chronic
Justification for the proposal	
There is no substance-specific information available with respect to fertility effects of silver zeolite. In the absence of substance-specific information, a robust classification proposal cannot be presented. However, due to the structural similarity with silver zinc zeolite and the similarity of effects observed with other silver salts that do not contain zinc, it is reasonable to assume that silver zeolite meets the criteria for classification Repr. 2; H361d (Suspected of damaging the unborn child), as concluded for silver zinc zeolite in the RAC opinion.	

b) Intended use, target species and effectiveness

Silver zeolite is used to treat surfaces and materials which come into contact with food and contribute to cross-contamination with pathogens. The silver ion is the active species, which is released out of the treated polymer. The silver ion interacts with the cell membrane of microorganisms, interferes with electron transport processes, binds to nucleic acids, inhibits enzymes and catalyses free radical oxygen species.

Treated polymers or coatings can be used to make or coat consumer items where an antimicrobial effect is desirable in a food/feed situation, for example: packaging, gaskets, food containers, trays and covers, plastic film, food wrap, tubing, appliances, food processing equipment and utensils, and for the treatment of granular activated carbon.

Generally, the antimicrobial effect of polymer materials containing silver active substances is dependent on how much of the silver is released. A precondition for the release of silver is a solvent, i.e. a liquid which the material comes into contact with. A dry polymer material surface will not release any silver ions and thus will not exert an antimicrobial effect. This is why claims and use-conditions have to be specified to be able to demonstrate efficacy. Efficacy has to be demonstrated for at least one example use, respectively, for the claims made.

A bacteriostatic claim has been made. The example uses given were 1: i) food packaging, ii) food containers, tubing, iii) food processing equipment, iv) food utensils. The function described for this use was to reduce cross-contamination[7] with pathogens. A second example use was derived from one of the efficacy tests submitted: “Treatment of granular activated carbon (GAC) in flow-through water filters to reduce clogging and pressure”.

Efficacy for the example applications listed under 1 has not been demonstrated. For these types of applications, demonstration of rather fast bacteriocidal effects would be necessary.

[7] Cross-contamination occurs when bacteria and viruses are transferred from a contaminated food or surface such as a chopping board to other food.

Neither use-conditions nor the necessary speed for the claimed effects have been shown with the efficacy tests submitted. Thus, bacteriocidal effects have not been demonstrated.

For example use 2 efficacy has been shown in a simulated use (tier 2) test against a mixture of bacteria (heterotrophic plate count). Thus, bacteriostatic efficacy under wet conditions has been demonstrated. Fungistatic effects, however, have not be shown.

Resistance

The risk of antibacterial resistance and cross resistance developing from an increased use of silver, in particular new and increasing wide-spread and disperse use in consumer products, cannot be assessed with the currently available information.

c) Overall conclusion of the evaluation including need for risk management measures

Human health

For several of the human health endpoints no substance-specific data is available. However, silver zeolite is expected to dissociate due to the acidic conditions of the stomach and the constituents of the substance are assumed to be absorbed individually. Therefore, the hazard assessment of silver zeolite is based on data available for each constituent of the substance, i.e. silver and the zeolite backbone.

The assessment of the silver ion is based on studies in which it is indirectly tested, i.e. studies performed with the read-across substances silver zinc zeolite, silver copper zeolite, silver sodium hydrogen zirconium phosphate, silver chloride and silver acetate. Based on information on silver ion content and silver ion release for the different silver substances, the dose of silver zeolite needed to achieve the equivalent silver ion exposure as present at the NOAELs set for these substances can be calculated.

Animal studies indicate low acute toxicity via oral, dermal and inhalation routes. The substance causes eye irritation but the severity of effects does not fulfil the criteria for classification. Based on weight of evidence of the data available, silver zeolite is not considered to have a skin sensitisation potential.

The substance is expected to dissociate in the gastrointestinal tract, and it is assumed, based on data for silver nitrate, that 5% of the active substance as well as of the silver ions released from silver zeolite are orally absorbed. Similarly, the dermal absorption is expected to be 5% based on data for silver nitrate.

Effects following subchronic exposure include an increased level of alkaline phosphatase and pigmentation, effects commonly seen in repeated dose toxicity studies with different silver substances. The pigmentation of tissues and organs is also the key effect considered for the derivation of the chronic reference value.

Results obtained with other silver zeolites, i.e. silver zinc- and silver copper zeolite, indicate a weak clastogenic potential *in vitro* but the negative result in an *in vivo* comet assay with silver zinc zeolite indicates that silver zinc zeolite and by read-across silver zeolite, are not expected to have genotoxic properties *in vivo*.

There is no substance-specific information on the chronic toxicity and carcinogenic potential of silver zeolite. However, it is not expected to fulfil the criteria for classification, since for the read across substance silver zinc zeolite it was concluded by the Risk Assessment Committee (RAC) that classification is not warranted.

There is no substance-specific data available for reproductive toxicity. Due to the structural similarity with silver zinc zeolite and taking into account developmental effects observed with other silver salts that do not contain zinc, it is reasonable to assume that silver zeolite also fulfils criteria for classification Repr. 2; H361d (suspected of damaging the unborn child), as concluded for silver zinc zeolite.

No robust information is available to assess the neurotoxic or immunotoxic potential of silver zeolite or the read across substances. However, the available data did not show clear indications of such properties.

An assessment of the endocrine disruptor (ED) properties was conducted. However, this ED assessment could not be finalised as the data are considered insufficient for an assessment against the criteria laid down in Regulation (EU) No 2017/2100.

The table below summarises the exposure scenarios assessed.

Industrial use

Scenario	Primary exposure and description of scenarios	Risk acceptable
Mixing and loading	Tier 1	no
	Tier 2 (respiratory protection, 95%)	no
	Tier 2 (protective gloves, 95%)	no
	Tier 2 (respiratory protection, 95% and protective gloves, 95%)	yes

Mixing and loading without personal protective equipment and by using either respiratory protection or protective gloves show unacceptable risks. However, the risk is acceptable for industrial professionals when appropriate PPE and RPE is worn.

Consumer use of solid biocidal products or solid treated articles[8] as food contact material

Summary table: indirect exposure via food		
Scenario	**Age group**	**Risk acceptable:**
Migration from polymers into food	Adult	no
	Child	no
	Toddler	no
	Infant	no
Migration into filtered water	Adult	yes
	Child	yes
	Toddler	yes
	Infant	no

Consumption of filtered water shows acceptable risk for adults, children and toddlers, but not for infants. Consumption of food having been in contact with treated food contact materials shows unacceptable risk.

For the migration into filtered drinking water scenario, the possibility of mitigating the unacceptable risks for infants was considered. A restriction could be introduced to limit the placing on the market of impregnated water filters – being treated articles – to such water filters which are used in gastronomy. A label on the water filter could indicate this restriction. This would imply that exposure of infants could only occur via the consumption of filtered

[8] Depending on the claim, some of the treated articles might be considered biocidal products.

drinking water in restaurants and bars where such filters are used in coffee machines and in the preparation of beverages.

The Biocidal Products Committee rejected these measures for the following reasons:

- It cannot be excluded that infants are exposed to silver zeolite via the consumption of filtered drinking water in restaurants and bars. This may be by customers of restaurants and bars bringing their infants with them but especially infants of the restaurant or bar owners.
- There are no data available – not to the committee nor presented by the applicant in their dossier – on the risk reduction potential of such a measure; data with respect to the in-house drinking water consumption of the general public versus outside the house (in for example restaurants and bars) and/or with respect to infants is lacking.
- There is no direct link between a warning given on the label, indicating that the impregnated water filter is for use in gastronomy only, and the objective of the measure (preventing the consumption by infants of drinking water which has passed through an impregnated filter).

Environment

Silver zeolite under the use envisaged, releases silver ions (Ag^+) which is the active component of silver zeolite. Owing to its use in treated articles, silver zeolite does not enter water bodies in its original composition (i.e. silver adsorbed to zeolite). It will dissociate and thus, the different components silver and zeolite will have different environmental fates. Silver is released from the treated polymers through ion exchange and migration in the presence of aquatic media, whereas the zeolite part is expected to mainly remain in the polymer matrix.

Emissions to atmosphere are negligible.

No unacceptable risks were identified for sewage treatment plants for the intended uses.

The standard concept of assessing the potential for bioaccumulation is not applicable for metals. Trophic transfer can be an important route of exposure, but evidence of significant biomagnification is lacking. No unacceptable risk for secondary poisoning has been identified.

No concern for groundwater is expected for the intended uses.

No further risks for the environment are identified from aggregated exposure to silver zeolite, including use in other product types.

The table below summarises the exposure scenarios assessed.

Polymer formulation – industrial use

Scenario	Aquatic	Terrestrial	Risk acceptable
Polymer formulation (handling, compounding and conversion of polymers from which articles are shaped)	yes	yes	yes

Solid biocidal products or solid treated articles[9] – service life

Scenario	Aquatic	Terrestrial	Risk acceptable
Treated articles, service life (release from treated kitchen utensils and water filters during use)	yes	yes	yes

The risk from polymer formulation is acceptable. Use of treated articles during service life shows acceptable risk.

Overall conclusion

Silver zeolite is supported in several Product Types (PT 2, 4, 7, and 9), hence it was assumed that a consumer can be exposed within the same time period to foods which have been in contact with food contact materials and to several other treated articles, which fall under other PTs than PT 4. Accordingly, a cumulative exposure assessment should have been performed. However, it was considered not manageable to take into account all possible exposure situations, noting the variety of use situations described in the dossiers and the variety of treated items. In order to compensate for possible simultaneous uses of different articles treated with silver zinc zeolite, the Technical Meeting IV 2013 agreed to compare the acute exposure with the chronic reference value as a pragmatic approach ("multiple exposure scenario"). The same approach was taken for the silver zeolite assessment for all supported PTs.

The following uses have shown unacceptable risks:

- Industrial use: mixing and loading without PPE and RPE;
- Consumption of food which has been in contact with treated polymers;
- Consumption of water filtered with silver treated active carbon for infants.

Due to risks to human health, no acceptable use has been identified. For the consumption of food which has been in contact with treated polymers and of water filtered with silver treated active carbon for infants these risks cannot be mitigated by introducing risk management measures. Thus, approval cannot be suggested.

[9] Depending on the claim, some of the treated articles might be considered biocidal products.

2.2. Exclusion, substitution and POP criteria

2.2.1. Exclusion and substitution criteria

The table below summarises the relevant information with respect to the assessment of exclusion and substitution criteria:

<table>
<tr><th colspan="2">Property</th><th colspan="2">Conclusions</th></tr>
<tr><td rowspan="3">CMR properties</td><td>Carcinogenicity (C)</td><td>No classification required</td><td rowspan="3">Silver zeolite does not fulfil criterion (a), (b) and (c) of Article 5(1)</td></tr>
<tr><td>Mutagenicity (M)</td><td>No classification required</td></tr>
<tr><td>Toxic for reproduction (R)</td><td>Repr. Cat. 2</td></tr>
<tr><td rowspan="3">PBT and vPvB properties</td><td>Persistent (P) or very Persistent (vP)</td><td>Silver zeolite as inorganic metal is excluded from the P assessment, taking into account Annex XIII of the REACH Regulation (EU) No 1272/2008.</td><td rowspan="3">Silver zeolite does not fulfil criterion (e) of Article 5(1) and does not fulfil criterion (d) of Article 10(1)</td></tr>
<tr><td>Bioaccumulative (B) or very Bioaccumulative (vB)</td><td>Silver zeolite is not B or vB.</td></tr>
<tr><td>Toxic (T)</td><td>Silver zeolite is T.</td></tr>
<tr><td rowspan="4">Endocrine disrupting properties</td><td>Section A of Regulation (EU) 2017/2100: ED properties with respect to humans</td><td colspan="2" rowspan="4">An assessment of the endocrine disrupting properties according to Regulation (EU) 2017/2100 was not conducted as non-approval is proposed. Consequently, no conclusion can be drawn whether silver zeolite fulfils criterion (d) of Article 5(1) with respect to humans or criterion (e) of Article 10(1) with respect to non-target organisms.</td></tr>
<tr><td>Section B of Regulation (EU) 2017/2100: ED properties with respect to non-target organisms</td></tr>
<tr><td>Article 57(f) and 59(1) of REACH</td></tr>
<tr><td>Intended mode of action that consists of controlling target organisms via their endocrine system(s).</td></tr>
<tr><td>Respiratory sensitisation properties</td><td colspan="3">Silver zeolite does not fulfil criterion (b) of Article 10(1). No classification required.</td></tr>
<tr><td>Concerns linked to critical effects other than those related to endocrine disrupting properties</td><td colspan="3">Silver zeolite does not fulfil criterion (e) of Article 10(1).</td></tr>
<tr><td>Proportion of non-active isomers or impurities</td><td colspan="3">Silver zeolite does not fulfil criterion (f) of Article 10(1).</td></tr>
</table>

The exclusion and substitution criteria were assessed in line with the "Note on the principles for taking decisions on the approval of active substances under the BPR"[10], "Further guidance on the application of the substitution criteria set out under article 10(1) of the BPR"[11] and "Implementation of scientific criteria to determine the endocrine-disrupting properties of active substances currently under assessment[12]" agreed at the 54th, 58th and 77th meeting respectively, of the representatives of Member States Competent Authorities for the implementation of Regulation 528/2012 concerning the making available on the market and use of biocidal products. This implies that the assessment of the exclusion criteria is based on Article 5(1) and the assessment of substitution criteria is based on Article 10(1)(a, b, d, e and f).

Consequently, the following is concluded:

Silver zeolite does not meet the exclusion criteria laid down in Article 5 of Regulation (EU) No 528/2012.

Silver zeolite does not meet the conditions laid down in Article 10 of Regulation (EU) No 528/2012 and is therefore not considered as a candidate for substitution.

The endocrine disruption properties have not been assessed as defined in Regulation (EU) No 2017/2100 and it is therefore not possible to finally conclude on the exclusion criteria related to Article 5(1)(d) and 10(1)(a), and on whether silver zeolite shall be considered a candidate for substitution related to Article 10(1)(e). This is in line with paragraph 16 of the "Implementation of scientific criteria to determine the endocrine-disrupting properties of active substances currently under assessment"[12].

2.2.2. POP criteria

POP criteria are not applicable for silver zeolite, as the substance is inorganic. There are no indications (monitoring data or modelling data) of any long-range transport potential of the active substance either.

2.3. BPC opinion on the application for approval of the active substance silver zeolite in product type 4

In view of the conclusions of the evaluation, it is proposed that silver zeolite shall not be approved. The criteria laid down in point (b)(iii) of Article 19(1) of Regulation (EU) 528/2012 are not met.

The active substance does not fulfil the criteria according to Article 28(2) to enable inclusion in Annex I of Regulation (EU) 528/2012. Silver zeolite gives rise to concern for human health and the environment, i.e. it is classified as Repr. 2 and as Aquatic acute 1.

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[10] See document: Note on the principles for taking decisions on the approval of active substances under the BPR (available from https://circabc.europa.eu/d/a/workspace/SpacesStore/c41b4ad4-356c-4852-9512-62e72cc919df/CA-March14-Doc.4.1%20-%20Final%20-%20Principles%20for%20substance%20approval.doc).

[11] See document: Further guidance on the application of the substitution criteria set out under article 10(1) of the BPR (available from https://circabc.europa.eu/d/a/workspace/SpacesStore/dbac71e3-cd70-4ed7-bd40-fc1cb92cfe1c/CA-Nov14-Doc.4.4%20-%20Final%20-%20Further%20guidance%20on%20Art10(1).doc.

[12] See document: Implementation of scientific criteria to determine the endocrine-disrupting properties of active substances currently under assessment (https://circabc.europa.eu/sd/a/48320db7-fc33-4a91-beec-3d93044190cc/CA-March18-Doc.7.3a-final-%20EDs-%20active%20substances%20under%20assessment.docx).