Risk Management Option Analysis Conclusion Document

Group Name: Oxime-releasing silanes in paints, coatings and sealants

EC-No.	CAS-No.	Name
202-496-6	96-29-7	Butanone oxime (MEKO)
MEKO-releasing silanes		
245-366-4	22984-54-9	Butan-2-one O,O',O''-(methylsilylidyne)trioxime (MOS)
218-747-8	2224-33-1	Butan-2-one O,O',O''-(vinylsilylidyne)trioxime (VOS; OS 2000)
251-882-0	34206-40-1	Butan-2-one O,O',O'',O'''-silanetetrayltetraoxime (TOS)
433-360-6	34036-80-1	2-Butanone-O,O',O''-(phenylsilylidyne)trioxime (OS-9000)
204-820-1	127-06-0	Acetone oxime
Acetone oxime-releasing silanes		
611-631-1	58190-57-1	2-Propanone, 2,2',2''-[O,O',O''-(ethylsilylidyne)trioxime] (EAC3)
460-110-3	797751-43-0	A mixture of: propan-2-one-O,O'-(methoxymethylsilandiyl)dioxime; propan-2-one-O-(dimethoxymethylsilyl)oxime; propan-2-one-O,O',O''-(methylsilantriyl)trioxime (Wasox-MMAC2)
458-680-3	797751-44-1	A mixture of: propan-2-one-O,O'(methoxyvinylsilandiyl)dioxime; propan-2-one-O-(dimethoxyvinylsilyl)oxime; propan-2-one-O,O',O''-(vinylsilantriyl)trioxime (Wasox-VMAC2)
640-410-2	2594-75-4	Methyl-tris acetonoximo-silane (MAC)
484-470-6	623-40-5	2-Pentanone oxime (MPKO)
MPKO-releasing silanes		
484-460-1	37859-55-5	2-pentanone,O,O',O''-(methylsilylidyne)trioxime (OS 1600)
700-810-0	58190-62-8	2-Pentanone, O,O',O''-(ethenylsilylidyne)trioxime (OS 2600)
700-833-6	1170315-90-8	2-Pentanone, O,O',O''-(phenylsilylidyne)trioxime (OS 9600)

942-139-8	1170315-92-0	Pentan-2-one O,O',O'',O'''-silanetetrayltetraoxime (OS 3600)
203-298-2	105-44-2	4-Methylpentan-2-one oxime (MIBKO)
MIBKO-releasing silane		
421-860-7	156145-64-1	2-Pentanone-4-methyl-,O,O',O''-(ethenylsilylidyne)trioxime (OS 2200)

Authority: German CA

Date: 21.12.2022

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Foreword

The purpose of Regulatory Management Option analysis (RMOA) is to help authorities decide whether further regulatory risk management activities are required for a substance and to identify the most appropriate instrument to address a concern.

RMOA is a voluntary step, i.e., it is not part of the processes as defined in the legislation. For authorities, documenting the RMOA allows the sharing of information and promoting early discussion, which helps lead to a common understanding on the action pursued. A Member State or ECHA (at the request of the Commission) can carry out this case-by-case analysis in order to assess whether further regulatory management measures are needed.

An RMOA can conclude that regulatory risk management at EU level is required for a substance (e.g. harmonised classification and labelling, Candidate List inclusion, restriction, other EU legislation) or that no regulatory action is required at EU level. Any subsequent regulatory processes under the REACH Regulation include consultation of interested parties and appropriate decision making involving Member State Competent Authorities and the European Commission as defined in REACH.

This Conclusion document provides the outcome of the RMOA carried out by the author authority. In this conclusion document, the authority considers how the available information collected on the substance can be used to conclude whether regulatory risk management activities are required for a substance and which is the most appropriate instrument to address a concern. With this Conclusion document the Commission, the competent authorities of the other Member States and stakeholders are informed of the considerations of the author authority. In case the author authority proposes in this conclusion document further regulatory risk management measures, this shall not be considered initiating those other measures or processes. Since this document only reflects the views of the author authority, it does not preclude Member States or the European Commission from considering or initiating regulatory risk management measures which they deem appropriate.

1. OVERVIEW OF OTHER PROCESSES / EU LEGISLATION

All oxime-releasing silanes addressed in this RMOA were also subject to a previous RMOA on 'MEKO, its oxime alternatives and the respective oxime-releasing silanes in paints, coatings and sealants'[1], except for MAC (EC 640-410-2), which was identified after conclusion of the previous RMOA using ECHA's in-depth substance/group search. In the prior RMOA the oxime-releasing silanes were evaluated exclusively with respect to their oxime-releasing properties. Potential risks particularly for consumers from inherent hazards of silanes, other than their oxime-release, i.e. due to oral and dermal exposure, are scrutinised in this follow-up RMOA.

Butanone oxime (MEKO)-releasing silanes

A substance evaluation (SEv) on MEKO by the German CA (DE CA) was concluded in 2014 and subsequently a CLH proposal was prepared. On this basis, ECHA's Risk Assessment Committee (RAC) adopted an opinion to classify MEKO as Carc. 1B (H350), Acute Tox. 3 (H301), Acute Tox. 4 (H312), Skin Sens. 1 (H317), Eye Dam. 1 (H318), Skin Irrit. 2 (H315), STOT SE 3 (H336), STOT SE 1 (H370; upper respiratory tract) and STOT RE 2 (H373; blood system). The corresponding inclusion into Annex VI of the CLP Regulation entered into force with the 15th ATP of the CLP Regulation in August 2020 and applies as of 1 March 2022.

OS-9000 has a harmonised classification as Skin Sens. 1 (H317), STOT RE 2* (H373) and Aquatic Chronic 3 (H412). So far, no further EU processes were initiated for this substance, except for this RMOA and the previous RMOA on oximes.

MOS and VOS were addressed in targeted Dossier Evaluations (DEv) by ECHA in 2021 and were included in the CoRAP due to concerns about suspected PBT/vPvB properties, their wide dispersive use and exposure of the environment. The entry was, however, withdrawn by the Italian Competent Authority (IT CA). For VOS, a testing proposal for an OECD TG 414 study was accepted by ECHA in 2018 (due date 26 July 2019).

TOS was not yet subject to any additional EU processes than this RMOA and the previous RMOA on oximes and oxime-releasers.

Acetone oxime-releasing silanes

A SEv on acetone oxime by the Austrian competent authority (AT CA) was concluded in 2016 and subsequently a CLH proposal was prepared. On this basis, RAC adopted an opinion to classify the substance as Carc. 1B (H350), Acute Tox. 4 (H312), Eye Dam. 1 (H318), Skin Sens. 1 (H317), STOT SE 3 (H336) and STOT RE 2 (H373; blood system) in March 2022. The corresponding inclusion into Annex VI of the CLP Regulation is pending.

Wasox-VMAC2 was addressed in a targeted DEv by ECHA in 2021 and a testing proposal for an OECD TG 114 study was accepted by ECHA in 2011. Wasox-VMAC2 was placed on the CoRAP in 2019 and is currently subject to an ongoing SEv by the ES CA due to following initial concerns: "Suspected PBT/vPvB" and "Exposure of environment". ECHA sent a corresponding SEv-Decision to the registrants in June 2021[2].

Wasox-MMAC, EAC3 and MAC were not yet subject to any additional EU processes than this RMOA and the previous RMOA on oximes and oxime-releasers.

[1] https://www.echa.europa.eu/documents/10162/a43b98e9-2bd7-daaf-ee3e-716b105a36cb
[2] https://echa.europa.eu/documents/10162/07693606-ca86-5c5e-d6a6-459d589f0eb9

2-pentanone oxime (MPKO)-releasing silanes

OS 1600 was subject to a comprehensive DEv, which was concluded without decision.

OS 2600, OS 3600 and OS 9600 were not yet subject to any additional EU processes than this RMOA and the previous RMOA on oximes and oxime-releasers.

4-methylpentan-2-one oxime (MIBKO)-releasing silanes

OS2200 was not yet subject to any additional EU processes than this RMOA and the previous RMOA on oximes and oxime-releasers.

2. CONCLUSION OF RMOA

This conclusion is based on the REACH and CLP data as well as other available relevant information taking into account the SVHC Roadmap to 2020, where appropriate.

Conclusions	**Tick box**
Need for follow-up regulatory action at EU level:	x
Dossier Evaluation under REACH	x
Substance Evaluation under REACH	x
Harmonised classification and labelling	x
Identification as SVHC (authorisation)	
Restriction under REACH	x
Other EU-wide regulatory measures	
Need for action other than EU regulatory action	
No action needed at this time	

3. NEED FOR FOLLOW-UP REGULATORY ACTION AT EU LEVEL

The identified group of oxime-releasing silanes used in consumer and professional products – and which thus may pose a health risk – consists of 13 substances in total. Four types of silanes were identified as MEKO-, acetone oxime- and MPKO-releasing silanes, respectively, and one further relevant silane derivative releases MIBKO. At least two of the oximes that are released from the silane derivatives upon hydrolysis, i.e. MEKO and acetone oxime, exhibit hazardous properties fulfilling SVHC criteria (i.e. harmonised classification as Carc. 1B; for acetone oxime a respective RAC opinion was adopted in March 2022), indicating that their silane derivatives fulfil these criteria as well. It is further considered likely that the oximes MPKO and MIBKO, which are released by the respective silane derivatives, display similar carcinogenic properties as MEKO and acetone oxime. The latter two sub-groups of silane derivatives are used more and more as substitutes for the hazardous MEKO- (and acetone oxime-) releasing silanes. However, professional and consumer uses, i.e. their use in paints, coatings and silicone sealants, were identified for all of the assessed oxime-releasing silanes.

In a previous RMOA, inhalation exposure to oximes released from sealants was assessed with regards to their potential health risks from applications for professional users and consumers. In this follow-up RMOA, the toxicological profiles of the oxime-releasing silanes per se, as well as their associated hydrolysis products and the effects on human health

due to possible oral and dermal exposure were addressed. In the course of this RMOA, it was concluded that indeed further hazards in addition to the carcinogenicity concern are of relevance when assessing potential risks of this group of substances. Particularly the hazards elicited after single and repeated exposure to the substances in focus (i.e. narcotic effects and/or haemolytic anaemia) were found to be of importance. In addition, it was concluded that beside inhalation exposure when using products containing oxime-releasing silanes, also oral and dermal exposure are relevant.

In summary, it was concluded that additional hazards beside carcinogenicity, as well as all three routes of exposure have to be considered in a comprehensive risk assessment. Thus, the overall aim of this RMOA was to identify possible additional risk management measures than those stated in the previous RMOA, if applicable.
Possible regulatory options for all 13 substances are presented in the following sections.

3.1 Dossier evaluation under REACH

Toxicological data from REACH registration dossiers of the oxime-releasing silanes were considered in this RMOA. It was examined whether the information outlined in the information requirements of REACH is available in the respective dossiers or whether adaptations of the information requirements were made.

For two silanes with Annex VIII information requirements (TOS, OS 9600) and two silanes with Annex VII information requirements (OS 3600, MAC), no toxicity studies are available in the registration documents, and exclusively read-across approaches were used by the registrant(s). Bridging studies are lacking. With regards to the other oxime-releasing silanes, read-across was often applied by the registrant(s), primarily for the endpoints STOT RE, mutagenicity and reproductive toxicity, either from the corresponding oxime or silanes from the same oxime-releaser sub-group but also from silanes of other oxime-releaser sub-groups. Bridging studies are often lacking. The validity and reliability of the read-across approaches was not examined in this RMOA and needs to be assessed in detail. Pursuant to Art. 41(1) ECHA may examine any registration in order to verify compliance.

3.2 Harmonised classification and labelling

Harmonised classification, especially regarding CMR properties, directly affects the use of hazardous substances in consumer products. For instance, the entry for MEKO as Carc. 1B, H350, in Annex VI of CLP (which applies as of March 2022[3]) triggered the labelling duty for mixtures containing the substance in concentrations of more than 0.1%. The same will apply for acetone oxime, when its entry into Annex VI of CLP is implemented. The aMSCA intends to prepare CLH proposals for the identified MEKO- and acetone oxime-releasing silanes, proposing classification of these substances for Carc. 1B, H350, due to the release of the carcinogenic oxime, MEKO and acetone oxime, respectively.

Regarding MPKO and MIBKO, which are released by the respective silane derivatives upon hydrolysis, the available toxicological information is insufficient to assess their carcinogenic properties. In addition, relevant carcinogenicity data for the oxime-releasing silanes are not available.

For MPKO a substance evaluation (SEv) was initiated in 2022 in order to clarify whether further data requirements are suitable to conclude on its potential carcinogenic properties. Based on the results of this evaluation, it may be required to classify MPKO and its silane derivatives for the hazard class carcinogenicity as well.

[3] https://echa.europa.eu/de/information-on-chemicals/cl-inventory-database/-/discli/details/108832

For MIBKO and its silane derivatives, the outcome of the SEv for MPKO will be awaited, in order to consider appropriate (regulatory) actions, e.g. the preparation of CLH dossiers or the initiation of another SEv.

Furthermore, it is noted that the evaluated oxime-releasing silanes in this RMOA elicit similar toxic effects (e.g. narcotic effects or effects on the haematopoietic system) when compared to MEKO and acetone oxime, respectively, which both warrant classification for the hazard classes STOT SE and STOT RE. The aMSCA intends to propose harmonised classification where appropriate.

Silanes were identified for which exposure to consumers is (highly) likely. These substances will have higher priority regarding the assessment of a need for classification than substances with unlikely consumer exposure.

3.3 Substance evaluation under REACH

As already specified in the previous RMOA conclusion[4] on oximes, chronic toxicity data are not available for MPKO, MIBKO or their silane derivatives to assess the carcinogenic potential, although information from structurally similar oximes MEKO and acetone oxime gives rise to a potential concern.

The available subacute and subchronic data generally indicate that all of the evaluated oximes as well as their releasers exhibit very similar hazard patterns when compared to MEKO and acetone oxime at similar exposure levels. This is particularly the case with respect to effects on the blood system, which may warrant classification. RAC, however, ruled out MEKO-induced haemolytic anaemia as an underlying mechanism for treatment-dependent tumour development, as the haematotoxicity did not match the pattern of increased tumours observed in male rats. Liver (cyto)toxicity was suggested as a contributing factor for the development of liver cancer as observed in male rats and mice, but a mode of action could neither be established for MEKO nor for acetone oxime, currently limiting the possibility of read-across to the other oximes, i.e. MPKO and MIBKO, and their oxime-releasing silanes.

Hence, a SEv is considered the measure of choice in order to clarify whether the use of these oximes and their silane derivatives pose a risk to human health, especially with regards to potential carcinogenic properties. Accordingly, the aMSCA initiated a SEv process in 2022 for MPKO which is registered at a high aggregated tonnage band of >1000 tpa (see also initial RMOA).

Depending on the outcome of this in-depth evaluation and potential additional study results, further regulatory measures (e.g. harmonised classification) may be proposed for MPKO and eventually also for silanes that release MPKO. Furthermore, based on the additional data possibly received upon SEv and DEv, read-across may be possible for MIBKO and thus enable a harmonised classification of MIBKO and the MIBKO-releasing silanes as well.

3.4 Identification as a substance of very high concern, SVHC (first step towards authorisation)

One oxime, namely MEKO, currently meets the criteria for identification as SVHC according to Art. 57a. Acetone oxime will fulfil this criterion as well, once the harmonised classification (Carc. 1B, H351) is included in Annex VI of CLP. Currently, the other two oximes, MIBKO and MPKO, and all of the identified oxime-releasing silanes do not formally

[4] https://echa.europa.eu/documents/10162/a43b98e9-2bd7-daaf-ee3e-716b105a36cb

meet any SVHC criteria.

Thus, candidate listing of these two substances, particularly without follow-up authorisation, is regarded as a less effective regulatory measure.

3.5 Identification as SVHC according to Art. 57a/authorisation under REACH

SVHC identification of MEKO and acetone oxime (and probably also the MEKO- and acetone oxime-releasing silanes in the near future) according to Art. 57a and further inclusion into Annex XIV could minimise the use of these substances in paints, coatings and sealants in an EU-wide manner. However, the aMSCA expects a strong shift to other oximes and respective oxime-releasing silanes in the categories of anti-skinning agents and sealants. Without clarification of the hazardous properties of these other oximes and silanes, it is not possible to foresee, whether authorisation is in fact an appropriate regulatory measure for the whole group of oxime-releasing silanes used in paints, coatings and sealants or if this regulatory action may result in "regrettable substitutions".

Furthermore, authorisation of MEKO and acetone oxime would not only address the use in paints and coatings but every additional use not in the focus of this RMOA as well. The release of oximes such as MEKO and acetone oxime from silicone-sealants, on the other hand, would not fall under the scope of the authorisations for MEKO and acetone oxime, but would imply additional, individual SVHC identification and authorisation processes. Therefore, authorisation of MEKO and acetone oxime, respectively, and subsequently also of the MEKO- and acetone oxime-releasing silanes and potentially also other oximes and oxime-releasing silanes is currently seen as a disproportionate regulatory measure.

3.6 Restriction under REACH

In this follow-up RMOA (see chapter 3), the aMSCA has identified additional hazard concerns potentially relevant for consumers, particularly with regard to uses of the described silanes in silicone sealants, but also in paints and coatings. The release of the carcinogens MEKO or acetone oxime from silicone-sealants, for instance, poses a risk to consumers and workers during use. However, also bystanders, which may be exposed to the hazardous substance due to the continuous release of MEKO over a longer period of time (range of days/weeks) after application (for details see initial RMOA[4]) may be at risk, e.g. in public facilities or due to household-near applications. Moreover, oral and dermal exposure need to be considered in addition to the expected inhalation exposure to the respective oximes. Thus, in addition to the potential to induce tumour formation, other hazardous properties, particularly the potential of the substances to induce narcotic effects and/or haemolytic anaemia, may become relevant when describing the risks for consumers and workers that arise from the use of oxime-releasing silanes.

A restriction under REACH could efficiently address the risks of released MEKO, acetone oxime and other carcinogenic oximes and at the same time cover additional hazards (i.e. haemolytic effects) arising from the oxime-releasing silanes, particularly those used in silicone sealants. By restricting the identified oxime-releasing silanes in specific applications, protection of consumers and workers may be ensured.

Similarly, restricting the use of MEKO, acetone oxime and other carcinogenic oximes as well as their silane derivatives in paints and coatings would provide a union-wide, harmonised safety level for consumers and workers. Overall, a restriction could address all of these specific uses, for which a risk was/may be identified. The restriction could also apply to imported mixtures, e.g. paints and sealants.

Further details and conditions of a restriction, e.g. alternatives and the socioeconomic impact, need careful weighing in order to adequately consider the protection aims for consumers and workers.

At present and in line with the previous conclusion of the initial RMOA[4], the aMSCA considers a restriction under REACH as an appropriate regulatory measure for the identified oxime-releasing silanes. A restriction could address the identified risks for consumers and workers from the use of MEKO and acetone oxime, as well as MEKO- and acetone oxime-releasing silanes, but also of other oximes and their respective oxime-releasers that may be classified in the future.

3.7 Other Union-wide regulatory measures

Derivation of a European occupational exposure limit value is not regarded as a sufficient regulatory measure in this case, as i) the required harmonised classification of most of the oximes and oxime-releasing silanes is lacking (so far, only MEKO would fulfil the requirements according to the Carcinogens, Mutagens and Reprotoxic Substances Directive (CMRD, Directive 2004/37/EC, CMRD; EC, 2022[5]); acetone oxime will follow in the near future) and ii) the risk for consumers in the described uses cannot be adequately addressed by an OEL.

[5] EC 2022: *OJ L 88, 16.3.2022, p. 1–14;* Directive (EU) 2022/431 of the European Parliament and of the Council of 9 March 2022 amending Directive 2004/37/EC on the protection of workers from the risks related to exposure to carcinogens or mutagens at work. URL: https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32022L0431

4. TENTATIVE PLAN FOR FOLLOW-UP ACTIONS IF NECESSARY

Indication of a tentative plan is not a formal commitment by the authority. A commitment to prepare a REACH Annex XV dossier (SVHC, restrictions) and/or CLP Annex VI dossier should be made via the Registry of Intentions (RoI).

Follow-up action	**Date for follow-up**	**Actor**
DEv (read-across assessment) for all assessed oxime-releasing silanes	TBD	ECHA
SEv for MPKO	2022 - ongoing	DE-CA
CLH proposal for MEKO- and acetone oxime-releasing silanes	2023	DE-CA
CLH proposal for MPKO, and potentially also MIBKO, cyclohexanone oxime	Depending on outcome of MPKO SEv	DE-CA
CLH proposal for MPKO-, MIBKO-, cyclohexanone oxime-releasing silanes	Depending on SEv and DEv outcome and outcome of potential CLH proposals for the respective oximes	DE-CA
Restriction for MEKO, acetone oxime and their silane derivatives	Depending on the other follow-up actions, i.e. CLHs on MEKO- and acetone oxime-releasing silanes	DE-CA
Restriction for MPKO (and potentially MIBKO and cyclohexanone oxime) and its (their) silane derivatives	Depending on read-across assessment (DEv outcome) and outcome of MPKO SEv	DE-CA