

Helsinki, 19 July 2018

Addressee: [REDACTED]  
[REDACTED]

Decision number: TPE-D-2114426300-67-01/F

Substance name: dimethoxymethylsilane

EC number: 240-914-9

CAS number: 16881-77-9

Registration number: [REDACTED]

Submission number: [REDACTED]

Submission date: 10.07.2014

Registered tonnage band: 100-1000T

### **DECISION ON A TESTING PROPOSAL**

Based on Article 40 of Regulation (EC) No 1907/2006 (the 'REACH Regulation'), ECHA has examined your testing proposal(s) and decided as follows.

**While your originally proposed test for a Pre-natal developmental toxicity study (Annex IX, Section 8.7.2.; test method: EU B.31./OECD TG 414) in a first species rat or rabbit), oral route using the analogue substance trimethoxy(methyl)silane, CAS No 1185-55-3 (EC No 214-685-0)**

**is rejected, you are requested to perform:**

- 1. Pre-natal developmental toxicity study (Annex IX, Section 8.7.2.; test method: EU B.31./OECD TG 414) in a first species (rats or rabbits), oral route using the registered substance.**

You may adapt the testing requested above according to the specific rules outlined in Annexes VI to X and/or according to the general rules contained in Annex XI of the REACH Regulation. In order to ensure compliance with the respective information requirement, any such adaptation will need to have a scientific justification, referring and conforming to the appropriate rules in the respective Annex, and an adequate and reliable documentation.

You are required to submit the requested information in an updated registration dossier by **26 July 2019**. You shall also update the chemical safety report, where relevant. The timeline has been set to allow for sequential testing.

The reasons of this decision are set out in Appendix 1. The procedural history is described in Appendix 2. Advice and further observations are provided in Appendix 3.

## **Appeal**

This decision can be appealed to the Board of Appeal of ECHA within three months of its notification. An appeal, together with the grounds thereof, shall be submitted to ECHA in writing. An appeal has suspensive effect and is subject to a fee. Further details are described under <http://echa.europa.eu/regulations/appeals>.

Authorised<sup>1</sup> by Ofelia Bercaru, Head of Unit, Evaluation E3

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<sup>1</sup> As this is an electronic document, it is not physically signed. This communication has been approved according to ECHA's internal decision-approval process.

## Appendix 1: Reasons

The decision of ECHA is based on the examination of the testing proposal submitted by you for the registered substance dimethoxymethylsilane, (CAS No 16881-77-9, EC No 240-914-9; hereafter referred to as "target substance").

In relation to the testing proposal subject to the present decision, you propose a testing strategy intending to fulfil the standard information requirement for a Pre-natal developmental toxicity study (Annex IX, Section 8.7.2.). In your testing strategy you propose to test the analogue substance trimethoxy(methyl)silane (CAS No 1185-55-3, EC No 214-685-0); hereafter referred to as "source substance"). The results from the structural analogue(s) will then be used to adapt the standard information requirements by using read-across and grouping approach following Annex XI, Section 1.5. of the REACH Regulation. ECHA has considered first the scientific validity of the proposed read-across and grouping approach (preliminary considerations; Section 0, below), before assessing the testing proposed (Section 1, below).

### 0. Grouping of substances and read-across approach

#### a. Legal Background on ECHA's assessment of the grouping of substances and read-across hypothesis

The evaluation by ECHA of testing proposals submitted by registrants aims at ensuring that generation of information is tailored to real information needs. To this end, it is necessary to consider whether programmes of testing proposed by you are appropriate to fulfil the relevant information requirements and to guarantee the identification of health and environmental hazards of substances. In that respect, the REACH Regulation aims at promoting wherever possible the use of alternative means, where equivalent results to the prescribed test are provided on health and environmental hazards.

Article 13(1) of the REACH Regulation provides that information on intrinsic properties of substances may be generated whenever possible by means other than vertebrate animal tests, including information from structurally related substances (grouping of substances and read-across), *"provided that the conditions set out in Annex XI are met"*.

The first Recital and the first Article of the REACH Regulation establish the *"promotion of alternative methods for assessment of hazards of substances"* as an objective pursued by the Regulation. In accordance with that objective, ECHA considers whether a prediction of the relevant properties of the substance subject to the present decision by using the results of the proposed tests is plausible based on the information currently available.

#### b. Description of the proposed grouping and read-across approach

You have provided the following arguments to justify the read-across approach:

*"To reduce animal testing REACH recommends to make use of a read-across approach where appropriate based on the high accordance in properties relevant for the specific endpoint. In the case of repeated dose toxicity relevant properties are structural similarity as well as physical-chemical and basic toxicological parameters in the same range. In the following paragraphs the read-across approach for dimethoxymethylsilane (CAS 16881-77-9) is evaluated point by point.*

*Read-across hypothesis*

*After exposure to dimethoxymethylsilane (CAS 16881-77-9) and trimethoxymethylsilane*

*(CAS 1185-55-3), both substances may hydrolyse ultimately to the common hydrolysis product methylsilanetriol. The non-silanol hydrolysis product methanol, is not expected to contribute to any adverse effects for systemic toxicity at the relevant dose levels. This is discussed further below.*

*The half-lives of dimethoxy(methyl)silane and trimethoxy(methyl)silane at 20-25 °C and at pH 7 are 0.3 and 2.2 h, respectively (see Section 4.1.1.1). As the hydrolysis reaction may be acid or base catalysed, the rate of reaction is expected to be slowest at pH 7 and increases as the pH is raised or lowered.*

*Reaction rate increases with temperature therefore hydrolysis will be faster at physiologically relevant temperatures compared to standard laboratory conditions. Under ideal conditions, hydrolysis rate can be recalculated according to the equation:*

$$DT50(X^{\circ}C) = DT50(T) \times e(0.08 (T-X))$$

*Where T = temperature for which data are available and X = target temperature.*

*Thus, for both substances the hydrolysis half-life is much shorter at 37.5°C and pH 2 (approximately 5 s)."*

*"The basis of the read across is the hydrolytic stability and relevance of the silanetriol hydrolysis products".*

*"Dimethoxymethylsilane hydrolyses in contact with water (half-life 0.3 hours at 20-25 °C), generating methylsilanediol, which is further oxidised to methylsilanetriol."*

c. Information submitted to support the grouping and read-across approach

You have provided several documents as separate attachments in IUCLID, Section 13, relevant to the testing proposed:

[REDACTED]

The document [REDACTED] is an overview of the grouping and read-across methods of Reconcile REACH submissions. The document describes the general principles applied but does not provide any substance-specific information. According to the report, "each CSR needs to describe clearly whether Category, Analogue or QSAR methods have been applied, and which endpoints they are applied to, and the IUCLID entries must be consistent with this". Based on this document, ECHA understands that you intend to apply analogue approach as a basis for data gap filling which are further justified in each registration dossier and CSR.

The document [REDACTED] is summarising the available physico-chemical and toxicological data on related substances.

The document [REDACTED] "outlines the approach" to mammalian toxicity of alkyl alkoxysilanes and silanols. It is explained that individual substances have been grouped for the "purposes of strategy and read-across approaches". A summary of mammalian toxicity and data matrix is provided. It is stated that "where there are data gaps, read-across will be performed from the closest available structurally related substance". The document does not provide information on the (read-across) approach used for individual substances, but states that "Details of test proposals and justification of read-across are given in individual Chemical Safety Reports".

Apart from the above general information you have provided the substance specific read-across hypothesis and justification, in the technical dossier, under the endpoint study summary for repeated dose toxicity, in Section 7.5; in the Chemical Safety Report (CSR) in section 5 and in a separate attachment [REDACTED] under the endpoint study record for pre-natal developmental toxicity, in Section 7.8.2.

This information includes the read-across hypothesis and justification, the identification of the source and target substances; comparison of the structural features, physico-chemical properties, predicted toxicokinetics properties and acute dose toxicity of the source and target substances. In the same place you also discuss the repeated systemic toxicity of the non-silanol hydrolysis products and conclude on your read-across approach.

In addition you have provided in the technical dossier of the target substance the following toxicological studies, relevant to the testing proposed.

For the target substance:

- an acute inhalation toxicity study (OECD 403, [REDACTED] (1988));
- a non-guideline, 11 days repeated dose toxicity study with rabbits (Losco P.E., Hermansky S.J., Weaver E.V., Ballantyne B. (1996));

For the source substance:

- results of a combined repeated dose toxicity with reproduction developmental toxicity screening test via oral route (OECD 422, [REDACTED] (2005));
- results of a sub-chronic repeated dose toxicity study via inhalation (OECD 413, [REDACTED] (2008)).

- d. ECHA analysis of the grouping approach and read-across hypothesis in light of the requirements of Annex XI, 1.5.

ECHA notes that the registrants of alkyl alkoxysilanes have grouped the substances in 'Analogue group', including the substance subject to the current decision, but the category approach is not proposed. Based on the substance specific justification for read-across approach and supporting information provided by you, ECHA understands that no category hypothesis /justification has been included and the proposed prediction is based on the analogue approach using trimethoxy(methyl)silane (CAS No 1185-55-3, EC No 214-685-0) as a source substance.

According to ECHA's understanding you suggest that based on their structural similarities target and source substances have similar properties:

- target and source substances undergo hydrolysis process and as a result "*substances may hydrolyse ultimately to the common hydrolysis product methylsilanetriol*";
- due to the similarity of the physico-chemical properties of the parent substances and their silanol hydrolysis product the substances would possess similar toxicokinetic profile; and
- hence the toxicological properties of the substances would be similar.

ECHA also understands that the basis of your hypothesis is the postulation:

- that the hydrolysis of the parent substances is both rapid and complete, leading to the formation of the proposed same silanol hydrolysis product (methylsilanetriol); and
- that the formed silanol substances are exclusively relevant in terms of bioavailability and hence would drive the systemic toxicity.

In addition, you claim that the non-silanol hydrolysis products do not contribute to any adverse effects for the systemic, reproductive or developmental toxicity.

In the following, ECHA examines whether the substances have indeed similar properties or that they would follow a regular pattern in their properties, before assessing the scientific validity of your postulation regarding the formation, relevance and exclusivity of the proposed silanol hydrolysis product as the driver for the systemic toxicity of the parent substances.

(i) Substance characterisation of source and target substances

The substance characterisation of the source substance(s) need to be sufficiently detailed in order to assess whether the attempted prediction is not compromised by the composition and/or impurities. In the ECHA practical guide 6 "How to report on Read-Across" it is recommended to follow the ECHA Guidance for identification and naming of substances under REACH and CLP (version 1.3, February 2014) also for the source substances. This ensures that the identity of the source substance and its impurity profile allows an assessment of the suitability of the substances for read-across purposes.

ECHA notes that the source substance has been characterised by its chemical name, structure and CAS No and no information on the composition or impurities has been provided in the technical dossier of the target substance.

In the read-across justification document you state that "*Detailed information on the purity/impurity profiles of substances in the analogue group is not described in detail in this report for reasons of commercial confidentiality. Substance-specific Substance Identity Profiles are available for all registered substances and these are included in the appropriate technical dossiers. In general, the substances in this group are typically monoconstituent substances of high purity (>90%) and typical impurities are other alkoxysilanes, alcohols or closely related substances. The specific identity of any impurities would not impact upon the approaches or conclusions for the endpoints covered by this report. In any case where a classified impurity is identified, the implications of this will be described in the individual Chemical Safety Report(s).*"

ECHA notes that the above general statement is not sufficient, for the following reasons.

Firstly, it is not supported by substance specific analysis of the possible differences in the composition and impurity profiles of the source and target substances and the impact they may have on the proposed prediction.

Secondly, ECHA notes that you have not clearly identified to which 'appropriate technical dossiers' you are referring to, which prevents ECHA from assessing the relevant data contained therein.

Finally, as already indicated by you, commercial confidentiality is at stake – which may also prevent ECHA from discussing with you the implications of potential substances' differences if it would be based solely on the data present in another registrant's dossier.

ECHA considers that currently the composition and the impurity profile of the source and target substances cannot be compared using the information provided in the registration dossier. Therefore, ECHA cannot reach conclusion whether the source substance can be used to predict properties for the registered substance.

(ii) Structural (dis)similarities and their impact on prediction

Structural similarity is a prerequisite for applying the grouping and read-across approach, but ECHA does not accept in general or in this specific case that structural similarity *per se* is sufficient to enable the prediction of human health properties of a substance, since structural similarity does not always lead to predictable or similar human health properties. It has to be justified why such prediction is possible in view of the identified structural differences and the provided evidence has to support such explanation. In particular, the structural similarities must be linked to a scientific explanation of how and why a prediction is possible.

You have described the structural similarities between target and source substances by indicating that they "*containing a silicon atom with an alkyl moiety and 2.3 alkoxy (-OX) groups*". ECHA notes that structural differences can be observed in the number of the alkoxy group. Whereas the source substance contains three methoxy (-OMe) groups, the target substance contains two methoxy (-OMe) groups bound to the Si (silicon) atom.

You have clearly identified the structural basis for the prediction, *i.e.* you postulate that both the source substance and the target substance "*hydrolyse, produce ultimately*" the same silanol hydrolysis product methylsilanetriol.

ECHA notes that you have not provided any information on how the structural differences may impact the toxicity of the substances and thus affect the possibility to predict properties of the target substance from the data obtained with the source substance.

The provided explanation is therefore not sufficient to establish a scientifically credible link between the structural similarity and the prediction.



In addition, ECHA notes that there is no information on whether other metabolic pathways of the parent substances and/or its hydrolysis products would occur and thus play a role in the systemic toxicity of the substances. Therefore, it is not possible to verify your assumption that only the proposed silanol hydrolysis products are relevant to drive the toxicity profiles of source and target substances.

You further propose that similarity in the acute dose toxicity supports the read-across approach. ECHA notes that the dossier contains only an acute inhalation toxicity study (OECD 403, [REDACTED] (1988)) and a non-guideline, 11 days repeated dose toxicity study with rabbits (Losco P.E., Hermansky S.J., Weaver E.V., Ballantyne B. (1996)) with the target substance. For the source substance a sub-chronic repeated dose toxicity study via inhalation (OECD 413, [REDACTED] (2008)), and a combined repeated dose toxicity with reproduction developmental toxicity screening test via oral route (OECD 422, [REDACTED] (2005)) is provided in the dossier. In addition, you quote the results of an acute dose oral, acute dose inhalation and an acute dose dermal study with the source substance in your read-across justification document.

ECHA notes that acute toxicity data alone is not sufficient to establish the toxicological profile of a substance with regard to toxicity to reproduction and/or pre-natal development. As no higher tier *e.g.* repeated dose toxicity study or screening study is available for the target substance comparison of toxicological profiles of the substances is not possible.

Therefore ECHA concludes that based on the presented information it is not possible to confirm that the substances would have similar properties or they would follow a regular pattern in their properties. In the absence of such information there is not an adequate basis for predicting the properties of the target substance from the data obtained with the source substance.

(iv) Hypothesis on formation, relevance and “*exclusivity*” of the silanol hydrolysis products, driving the toxicity

ECHA understands that the hypothesis relies on the assumption that both target and source substances undergo rapid and complete hydrolysis at pH 2 (within seconds) and they may ultimately form the same silanol hydrolysis products methylsilanetriol. You propose that based on the formation and relevance of the similar silanol hydrolysis products, properties of the source substance can be used to predict the properties of the target substance and: “*The basis of the read across is the hydrolytic stability and relevance of the silanetriol hydrolysis products*”.

Firstly, ECHA observes that hydrolysis half-life rate at pH2 are based on assumptions which are not substantiated by data. ECHA notes that there is no hydrolysis data available in the registration dossier for pH 2 (neither for the target nor for the source substance) but instead you have postulated that the rate of the hydrolysis reaction is dependent on hydronium ion concentration and that there will be a 100 fold increase in hydrolysis rate on going from pH 4 to pH 2. ECHA accepts that the hydrolysis is catalysed by the hydronium ion, however there is no evidence provided to suggest such a dependence on the hydronium ion concentration and consequently ECHA considers the assumption of a 100 fold increase in hydrolysis rate on going from pH 4 to pH 2 as not supported by scientific evidence.

Secondly, ECHA considers that the formation of the proposed silanol hydrolysis products which are the basis of the hypothesis is not supported by data. Specifically, ECHA notes that the formation of the proposed silanol hydrolysis product from source substance would involve three hydrolysis steps. The formation of the proposed silanol hydrolysis product from the target substance would involve two hydrolysis steps followed by an oxidation step: *"Dimethoxymethylsilane hydrolyses in contact with water (half-life 0.3 hours at 20-25 °C), generating methylsilanediol, which is further oxidised to methylsilanetriol."* In the hydrolysis studies provided in the registration dossier there is no evidence of the proposed oxidation step and on the formation of the proposed silanol hydrolysis product so it is not possible to verify that ultimate hydrolysis of both target and source substances has indeed occurred within the timeframe of the test.

Furthermore, you have not substantiated your assumption of a complete hydrolyses. In fact, the hydrolysis process which involves several steps may produce also other substances, which possible presence and effects on your hypothesis you have not addressed.

Thirdly, your assumption that the silanols are exclusively relevant in terms of bioavailability and hence would drive the systemic toxicity is not supported by data. In fact you acknowledge the occurrence of condensation reaction following the hydrolysis of the parent substances but you did not consider the implication of such reaction on the prediction. You explain that the silanol hydrolysis product may undergo condensation reactions leading to the formation of siloxane dimers, oligomers and polymers and state that: *"A highly cross-linked gel may form. The degree of condensation that will occur may vary with:*

- *Concentration of the silanol; the greater the initial concentration, the greater the degree of condensation. Significant condensation is not expected at concentrations less than approximately 100 mg/l, but is dependent on specific conditions.*
- *pH; the condensation reaction may be either acid or base catalysed.*
- *Temperature*
- *Other species present*
- *Timescale*
- *The nature of the R-group".*

Moreover, ECHA observes that the degree of condensation also depends on the number of Si-OH groups will have impact on the condensation reaction; (e.g. silanetriols condense more rapidly than silanediols).

ECHA notes that you have not specified the conditions, neither for the target nor for the source substance, under which the condensation occurs. In particular, substance specific concentration limit, specific pH, temperature and impact of the groups bound to the Si atom are not defined. In consequence, the nature of the condensation products and their rate of formation under conditions relevant to the proposed test(s) are not clear. Thus exposure to condensation products cannot be ruled out following administration of the source and target substances but you have not addressed how and in which manner the condensation products of the source and target substances would affect the systemic toxicity.

Finally, ECHA notes that you have not addressed adequately how the formation of the non-silanol hydrolysis products influences the prediction. As a result of the hydrolysis reaction a non-silanol hydrolysis product is also formed: methanol which is the same for both the target and source substances. You claim that the non-silanol hydrolysis product play no significant role in the systemic toxicity of the substances as "The non-silanol hydrolysis product methanol, is not expected to contribute to any adverse effects for systemic toxicity at the relevant dose levels."

ECHA notes that in your read across justification you have not provided information on the "relevant dose levels". In addition, your proposal did not address the possible interactions between the parent substances and their hydrolysis products and you have not taken into consideration the implication of such reaction on the prediction.

In summary, ECHA considers that, given the lacking evidence on the formation, and relevance of the proposed silanol hydrolysis products, your hypothesis that only the silanols are relevant in terms of bioavailability and hence would drive the systemic toxicity cannot be confirmed. Therefore, there is not an adequate basis for predicting the human health properties of the target substance from the data obtained with the source substance.

e. Conclusion on the read-across approach

Based on the above considerations ECHA concludes that you have not provided adequate and reliable information to demonstrate that the proposed read-across approach is plausible for the endpoint(s) in consideration. ECHA therefore concludes that the criteria of Annex XI, Section 1.5, are not met, and consequently the testing proposed on the read-across substance is not appropriate to fulfil the information requirement(s) of the substance subject to the present decision.

**1. Pre-natal developmental toxicity study (Annex IX, Section 8.7.2.) in a first species**

Pursuant to Article 40(3)(d) and (c) of the REACH Regulation, ECHA may reject a proposed test and require the Registrant to carry out other tests in cases of non-compliance of the testing proposal with Annexes IX, X or XI.

A pre-natal developmental toxicity study for a first species is a standard information requirement as laid down in Annex IX, Section 8.7.2. of the REACH Regulation. The information on this endpoint is not available for the registered substance but needs to be present in the technical dossier to meet the information requirements. Consequently there is an information gap and it is necessary to provide information for this endpoint.

You have submitted a testing proposal for a pre-natal developmental toxicity study in rats according to EU B.31./OECD TG 414 by the oral route according to EU B.31./OECD TG 414 with the analogue substance trimethoxy(methyl)silane, CAS No 1185-55-3 (EC No 214-685-0).

ECHA has evaluated your proposal to perform the test with the analogue substance. As explained in Section 0 '*Grouping of substances and read-across approach*' of this decision, your adaptation of the information requirements cannot be accepted. Hence there is a need to test the registered substance.

ECHA considers that the proposed study performed with the registered substance is appropriate to fulfil the information requirement of Annex IX, Section 8.7.2. of the REACH Regulation.

You proposed testing by the oral route. ECHA agrees that the oral route is the most appropriate route of administration for substances except gases to focus on the detection of hazardous properties on reproduction as indicated in ECHA *Guidance on information requirements and chemical safety assessment* (version 6.0, July 2017) R.7a, chapter R.7.6.2.3.2. Since the substance to be tested is a liquid ECHA concludes that testing should be performed by the oral route.

In your comments to the draft decision you did not provide considerations to this specific endpoint.

#### Outcome

Therefore, pursuant to Article 40(3)(c) of the REACH Regulation, you are requested to carry out the study with the registered substance subject to the present decision: Pre-natal developmental toxicity study in a first species (rats or rabbits), oral route (test method: EU B.31./OECD TG 414) while your originally proposed test for a Pre-natal developmental toxicity study (Annex IX, Section 8.7.2.; test method: EU B.31./OECD TG 414) in a first species rat or rabbit, oral route using the analogue substance trimethoxy(methyl)silane, CAS No 1185-55-3 (EC No 214-685-0) is rejected according to Article 40(3)(d) of the REACH Regulation..

#### *Notes for your consideration*

For the selection of the appropriate species you are advised to consult ECHA *Guidance on information requirements and chemical safety assessment* (version 6.0, July 2017), Chapter R.7a, section R.7.6.2.3.2.

ECHA notes that a revised version of OECD TG 414 was adopted this year by the OECD. This revised version contains enhancements of certain endocrine disrupting relevant parameters. You should test in accordance with the revised version of the guideline as published on the OECD website for adopted test guidelines ([https://www.oecd-ilibrary.org/environment/oecd-guidelines-for-the-testing-of-chemicals-section-4-health-effects\\_20745788](https://www.oecd-ilibrary.org/environment/oecd-guidelines-for-the-testing-of-chemicals-section-4-health-effects_20745788)).

## **Appendix 2: Procedural history**

ECHA received your registration containing the testing proposal(s) for examination pursuant to Article 40(1) on 10 July 2014.

ECHA held a third party consultation for the testing proposal(s) from 16 October 2014 until 1 December 2014. ECHA did not receive information from third parties.

The decision making followed the procedure of Articles 50 and 51 of the REACH Regulation, as described below:

ECHA notified you of the draft decision and invited you to provide comments. ECHA took into account your comments and did not amend the request(s).

You were notified that the draft decision does not take into account any updates after 6 July 2016, 30 calendar days after the end of the commenting period.

However, following your request and justification provided (including interlinked read-across testing strategy on several supposedly related registered substances) ECHA has exceptionally granted you additional time until 30 June 2017 for the update for the update of the IUCLID dossier.

You did not update the dossier by the given deadline.

ECHA notified the draft decision to the competent authorities of the Member States for proposals for amendment.

As no amendments were proposed, ECHA took the decision according to Article 51(3) of the REACH Regulation.

**Appendix 3: Further information, observations and technical guidance**

1. This decision does not imply that the information provided in your registration dossier is in compliance with the REACH requirements. The decision does not prevent ECHA from initiating a compliance check on the registration at a later stage.
2. Failure to comply with the request(s) in this decision, or to fulfil otherwise the information requirement(s) with a valid and documented adaptation, will result in a notification to the Enforcement Authorities of the Member States.
3. In carrying out the test(s) required by the present decision it is important to ensure that the particular sample of substance tested is appropriate to assess the properties of the registered substance, taking into account any variation in the composition of the technical grade of the substance as actually manufactured or imported. If the registration of the substance covers different grades, the sample used for the new test(s) must be suitable to assess these. Furthermore, there must be adequate information on substance identity for the sample tested and the grade(s) registered to enable the relevance of the test(s) to be assessed.