



**Committee for Risk Assessment
RAC**

**Annex 2
Response to comments document (RCOM)
to the Opinion proposing harmonised classification and
labelling at EU level of
Copper flakes (coated with aliphatic acid)**

**EC number: 231-159-6
CAS number: 7440-50-8**

CLH-O-0000001412-86-30/F

**Adopted
04 December 2014**

ANNEX 2 - COMMENTS AND RESPONSE TO COMMENTS ON CLH PROPOSAL ON COPPER FLAKES (COATED WITH ALIPHATIC ACID)

COMMENTS AND RESPONSE TO COMMENTS ON CLH: PROPOSAL AND JUSTIFICATION

Comments provided during public consultation are made available in this table as submitted by the webform. Please note that some attachments received may have been copied in the table below. The attachments received have been provided in full to the dossier submitter and RAC.

ECHA accepts no responsibility or liability for the content of this table.

Substance name: copper flakes (coated with aliphatic acid)

CAS number: 7440-50-8

EC number: 231-159-6

Dossier submitter: France

GENERAL COMMENTS

Date	Country	Organisation	Type of Organisation	Comment number
03.02.2014	United Kingdom	Regulatory Compliance Limited	Industry or trade association	1
Comment received				
<p>We acknowledge and appreciate the alignment with the copper risk assessment dossier as well as the incorporation of some post risk assessment data. For most endpoints, the data used and the interpretation of the data reflect the hazard profiles agreed in the copper Risk Assessment Report (RAR) and used for the copper flakes (coated with aliphatic acid) REACH dossier.</p> <p>For some endpoints, we noted some differences in data-interpretation between the copper flakes (coated with aliphatic acid) CLH report and the REACH dossier. For two endpoints, new high-quality studies (Reliability 1), not yet considered in the CLH report, are available. We have therefore focused the review on these endpoints and propose to revise the classification to:</p> <ul style="list-style-type: none">- Acute inhalation toxicity: no classification , based on the results of the high quality acute inhalation study from Leuschner (2011 - Attachment 1, see confidential attachments).- Environmental hazard chronic category 2 (H 411) , when considering the results of the transformation/ dissolution study from Schaefers and Klawonn (2013 – Attachment 2, see confidential attachments). <p>See non-confidential and confidential attachments. <i>ECHA note: Please see attachment no. 2,3,4,6 and 7.</i></p>				
Dossier Submitter's Response				
<p>Human health hazard:</p> <p>The study of Wesson was judged reliable by France and by the notifier of the substance under biocide regulation.</p> <p>France agrees with European copper institute that the MMAD values were around 5 µm which is superior to required MMAD in the OECD 403 guideline (1-4µm). However, this deviation is not considered as a sufficient argument to not accept the study even if France has the opinion that the hazard could thus be under-estimated.</p> <p>In addition, more information on the identity of aliphatic acid coated copper flake used in the study of Leuschner should be provided to understand if differences in types of aliphatic acid or additives can explain the differences of results. However, FR considers that it does</p>				

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not discard the relevance of the study of Wesson that justify the proposed classification Acute Tox 3 – H331.

France proposes to keep the classification of Coated copper flake for acute inhalation endpoint.

Environmental hazard: see response to detailed comment no 7 below.

RAC's response

Human health hazard: see RAC's response to comment no. 4.

Environmental hazard:

Date	Country	Organisation	Type of Organisation	Comment number
03.02.2014	Germany	European Metal Particulates Association - a division of the German Aluminium Association	Industry or trade association	2

Comment received

EMPA represents the industry, which is the affected industry by the CLH report on coated copper flakes as our member companies' product portfolio consists of these copper based flake products.

Dossier Submitter's Response

Noted

RAC's response

Noted

Date	Country	Organisation	Type of Organisation	Comment number
03.02.2014	Germany		MemberState	3

Comment received

The DE CA supports the FR CA's proposal for classification as Acute Tox 3 – H331, Acute Tox 4 – H302. The DE CA has general problems with some methodologies referring to the environmental classification used in the CLH-proposal.

Dossier Submitter's Response

Human health hazard: ok thank you

Environmental hazard: see response to detailed comment below

RAC's response

Human health hazard: Noted

Environmental hazard:

OTHER HAZARDS AND ENDPOINTS – Acute Toxicity

Date	Country	Organisation	Type of Organisation	Comment number
03.02.2014	United Kingdom	Regulatory Compliance Limited	Industry or trade association	4

Comment received

The availability of a high quality study (Leuschner, 2011 (unpublished study)) is carried

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forward for the classification and the low quality study (Wesson, 2001 (unpublished study)) is now rejected.

Following the conclusions from the highest quality study (Leuschner, 2011), it is concluded that copper flakes, coated with aliphatic acids, do not merit classification for acute inhalation toxicity.

See confidential and non-confidential attachments.

ECHA note: Please see attachment no. 6.

The information below was provided in Comments to the CLH dossier copper flakes ECI Jan 2014.doc [attachment 2]

ECI COMMENTS TO

CLH REPORT: PROPOSAL FOR HARMONIZED CLASSIFICATION AND LABELLING OF COPPER FLAKES (COATED WITH ALIPHATIC ACID)

These comments also reflect the considerations of the following task forces and consortium;

European Antifouling Copper Task Force

Wood Preservative Copper Task Force

The Copper Task Force (Plant Protection Products Regulation [PPPR])

Copper Compound Consortium

ABSTRACT

We acknowledge and appreciate the alignment with the copper risk assessment dossier as well as the incorporation of some post risk assessment data. For most endpoints, the data used and the interpretation of the data reflect the hazard profiles agreed in the copper Risk Assessment Report (RAR) and used for the copper flakes (coated with aliphatic acid) REACH dossier.

For some endpoints, we noted some differences in data-interpretation between the copper flakes (coated with aliphatic acid) CLH report and the REACH dossier. For two endpoints, new high-quality studies (Reliability 1), not yet considered in the CLH report, are available. We have therefore focused the review on these endpoints and propose to revise the classification to:

- Acute inhalation toxicity: no classification¹, based on the results of the high quality acute inhalation study from Leuschner (2011 - Attachment 1)
- Environmental hazard chronic category 2 (H 411)², when considering the results of the transformation/ dissolution study from Schaefer and Klawonn (2013 – Attachment 2)

1) INTRODUCTION

We appreciate the opportunity to review the CLH report but do regret the significant overlap between the

¹ CLH report proposal: Acute tox. 3 – H331

² CLH report proposal: Chronic 1 H410

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public consultation period and the year-end holidays.

We acknowledge and appreciate the alignment between the CLH report and the copper risk assessment dossier as well as the incorporation of some post risk assessment data. For most endpoints, the data used and interpretation of the data reflect the hazard profiles agreed in the copper risk assessment and used for the copper REACH dossier.

We have identified two studies that are important as input to the final CLH report:

- Acute toxicity – inhalation: An, acute inhalation study on copper flakes **Wesson (2001)** was identified and used in the original REACH dossier (2010) and CLH report. Important quality issues with the Wesson (2001) study were however identified and described in the REACH 2010 dossier. Therefore, a high quality acute inhalation study was carried out (**Leuschner 2011 – Attachment 1**). These data were included in the updated REACH dossier (2013).

- In absence of transformation/dissolution data on coated copper flakes, the aquatic acute and chronic hazard profile (REACH 2010 and CLH report) was based on the ecotoxicity of soluble copper species and the surface area dependent copper release equations, defined for copper powders. Considering the uncertainty in defining the chronic classification (CLP 2012 guideline) at pH 7, a 28 days transformation/ dissolution test (OECD 29) was performed (**Schaefers and Klawonn, 2013 – Attachment 2**) and included in the updated REACH dossier (2013).

The studies allowed to refine the acute inhalation and environmental classifications, as described below

2) ACUTE TOXICITY – INHALATION

The two critical acute inhalation toxicity studies (Wesson 2001 and Leuschner 2011) differ substantially with respect to results, as well as their reliability and suitability for C&L purposes. The results of both experimental studies are summarised in the following table and discussed in detail below.

Table 1: Overview of experimental studies on acute toxicity after inhalation exposure

Method	Results	Remarks	Reference
rat (Sprague-Dawley) male/female inhalation (nose only) OECD Guideline 436 (Acute Inhalation Toxicity: Acute Toxic Class (ATC) Method)	LC50 (4 h): > 5.11 mg/L air (male/female) based on: test mat. (There was no evidence of respiratory tract irritation.)	1 (reliable without restriction) key study experimental result Test material (Common name): Coated copper flakes	Leuschner, J. (2011) not included in CLH report (see Attachment 1)
rat (Sprague-Dawley) male/female inhalation (nose only) OECD Guideline 403 (Acute Inhalation Toxicity)	LC50 (4 h): 1.03 mg/L air (analytical) (male/female) LC50 (4 h): 0.733 mg/L air (analytical) (male) LC50 (4 h): 1.67 mg/L air (analytical) (female)	3 (not reliable) disregarded study experimental result Test material (Common name): Coated copper flake	Wesson, CM. (2001)

Acute inhalation study 1: Wesson, CM (2001) Guideline: OECD 403, GLP: Yes:

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While the study results are described in the CLH report, the report does not consider the deviation in the study.

Expert statement - Aspects of the study that question the validity of the obtained results:

a) Purity of the test substance:

This is given as 98%. However, no batch number, , or any certificate of analysis is provided, so that the sample tested is not adequately identifiable.

The inhalation toxicity study, also does not address the fatty acid stabiliser component, and to which degree it is present in the copper flakes tested. Taking the source of the material into account and the production technology at the time, the industry assumes that zinc stearate has been used as milling additive.

b) Maintenance of stable test concentrations:

Current guidance (e.g. EU method B.2, OECD 403) states that “during the exposure period, the concentration should not vary by more than $\pm 15\%$ of the mean value. However in the case of some aerosols, this level of control may not be achievable and a wider range would then be acceptable (without specifying any such wider range)”.

It is, however, noted that OECD 433 in its draft, dated June 2004, and the OECD draft guidance document No. 39, dated October 2002, state that “to prevent unnecessary repeat testing, a test atmosphere is considered acceptable for regulatory purposes if the mean of the test atmosphere samples is within $\pm 25\%$ of the concentration tested.”

For an assessment of the stability of the test concentrations, the averages over the entire study period are calculated for each test concentration, and the percentage deviation from the average for each time point is derived, as depicted in the figure below:

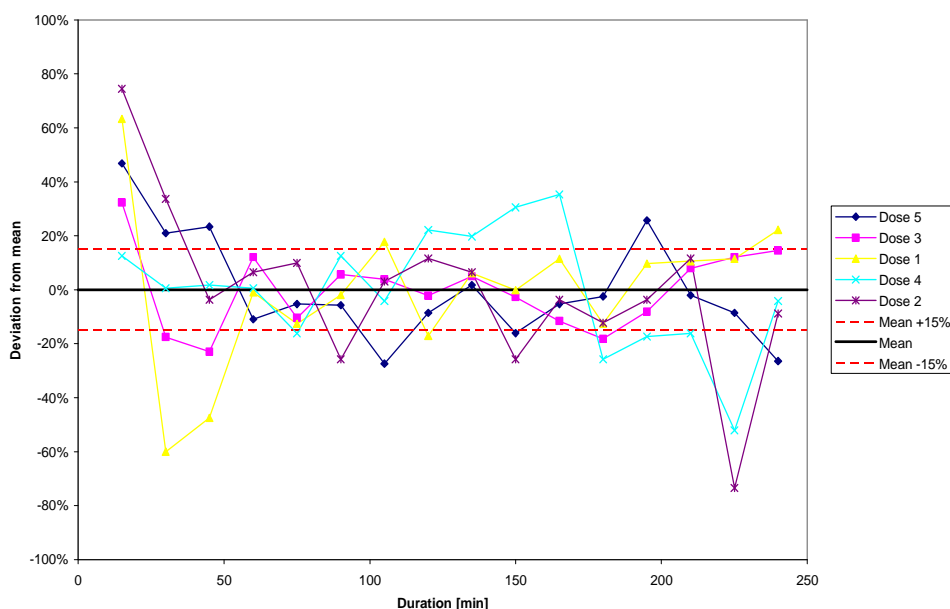


Figure 1: Variations in the atmosphere concentrations during the exposure period. Mean achieved atmosphere concentrations: group 5: 2.13 mg/L; group 3: 1.68 mg/L; group 1: 1.12 mg/L; group 4: 0.84 mg/L; group 2: 0.59 mg/L

In conclusion, the data show that the starting concentrations, only measured after 20 minutes, are very high (15-70% above the mean value) and the variation of the atmosphere concentrations, during this study, exceeded not only the ranges of $\pm 15\%$ and $\pm 25\%$ of the average, at all test concentration levels, but also at

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various and numerous sampling intervals. Thus, the maintenance of stable test concentrations was not according to the expectations of the test guideline.

c) Particle size tested:

Current guidance (e.g. OECD 436; 2009) explicitly requires the use of a test material, with an MMAD between 1 - 4 µm and a GSD in the range of 1.5 – 3 µm, to allow exposure of all relevant regions of the respiratory tract.

The MMAD values derived in the study for each test group are as follows:

Table 2: MMAD values

Dose group	5	3	1	4	2
MMAD	5.86	5.34	4.49	5.57	5.26
GSD	2.94	2.73	2.74	3.12	3.25

Given that the laboratory, in many cases, only achieved actual concentrations of approx. 20-30% of nominal and that the reported MMAD was around 5 µm it may easily be speculated that the test aerosol generated was not reflective of the total material but, instead, only a very minor fraction of the test material was actually transferred to the respiratory tract of the test animals.

Combined with the lack of maintaining stable test concentrations and the high starting concentration for most dose groups, this intrinsic particle-size related “fractionation” of the material, during generation of the test atmospheres, renders any conclusion based on the toxicity of the test substance unreliable.

Interpretation of results

The study demonstrates a clear lack of a dose response which limits its reliability significantly (see CLH report Table 12).

The test guideline requires that LC50 values be given separately for each sex. However, regulation (EC) 1272/2008 does not explicitly specify whether “pooled”, or data separate for each sex, should be considered. The laboratory employed “pooled” data for classification purposes (LC50 = 1.03 mg/L, classification with R20 “harmful by inhalation”). Applying a more conservative (precautionary) approach, by employing the data obtained for males (LC50 = 0.733 mg/L) for classification purposes, would require a classification with R23 “toxic by inhalation” ($1 < \text{LC50} \leq 5 \text{ mg/L}$).

However, there is no apparent reason why males should behave differently to females in this context. Given the inconsistencies in the stability of the test atmospheres, with numerous exceedances of the specified tolerances for deviation from the average test concentration, the derived LC50 values are not suitable for C&L purposes.

Conclusion

The main deviations identified can be summarized as:

- no information on stability and batch no. of the tested batch are provided.
- no information on impurities is provided - the substance was tested for submission as a biocidal product and the addition of, e.g. zinc stearate, is not uncommon (see REACH dossier “copper”).
- large differences between the target and actual doses (see expert statement above).
- exceedingly high concentration at the beginning of the experiment for most concentrations.
- test aerosol generated was not reflective of the total material (see expert statement above).
- lack of clear reported dose-response.

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- animals were not acclimatised to the test apparatus.

These deviations are considered to have influenced the outcome and the integrity of the study for copper coated flakes. Therefore, the study was rated with RL3 (not reliable).

As a final consequence, an appropriately designed acute inhalation toxicity study, with a well defined coated copper flakes (KU 7600 standard material), was conducted (see Leuschner, J. (2011)).

Acute inhalation study 2: Leuschner, J. (2011) Guideline: OECD 436, GLP: Yes, Deviations: None [Attachment 1]

The aim of the study was to obtain information on the acute toxicity and respiratory irritation, following a single 4-hour inhalation exposure of rats to aliphatic acid coated copper flakes (KU 7600 standard material).

Rats (3m/3f each) were exposed to a dry aerosol of coated copper flakes at gravimetrically determined concentrations of 1.24 ± 0.03 and 5.11 ± 0.02 mg/L air for 4 hours by inhalation using a dynamic, nose-only exposure chamber. The aerosol was generated with the aid of a dry, rotating brush dust generator.

In the inhalation chamber, close to the animals' noses, the generated aerosol particulates had mass median aerodynamic diameters (MMAD) of $3.477 \mu\text{m}$ (1.24 or 5.11 mg/L). The Geometric Standard Deviations (GSD) of the MMADs were calculated as 2.61 or 2.77 (1.24 or 5.11 mg/L).

Mortality and general signs of toxicity

Under these test conditions, a 4-hour inhalation exposure to coated copper flakes, at concentrations of 1.24 or 5.11 mg/L air, did not lead to prematurely deceased animals.

One of three females treated with the low concentration and two of three females treated with the high concentration showed a lower body weight gain at the end of the study (respectively $+2.9\%$, $+2.5\%$ and $+3.3\%$ compared to the start value). Other female animals, treated with the low concentrations, showed $+7.1\%$ and $+10.0\%$. The remaining females, treated with high concentrations, showed $+6.1\%$.

Clinical signs

A 4-hour inhalation exposure to coated copper flakes, at concentrations of 1.24 or 5.11 mg/L air, revealed concentration-related slight to moderate ataxia, slight to moderate tremor and slight to moderate dyspnoea (reduced frequency of respiration with increased volume) on test day 1, immediately after end of exposure until 3 hours or until test day 4, in all animals, respectively (3 of 3 male and 3 of 3 female, each). In addition, reduced motility was observed in all animals, at 5.11 mg/L air 2 to 4 days after exposure.

Macroscopic changes in the nasal cavity and lungs

Dark or slight grey-stained discoloured lungs were observed in two males, at the dose level of 1.24 mg/L, or in one male and one female at the dose level of 5.11 mg/L.

Result

Under the conditions of this study, the 4-hour inhalation LC₅₀ of coated copper flakes is >5.11 mg/L air. No evidence of respiratory tract irritation could be observed.

The test lab concluded: According to the EC-Commission directive 67/548/EC and its subsequent amendments on the approximation of the laws, regulations and administrative provision relating to the classification, packaging and labelling of dangerous substances and the results obtained under the present test conditions, Copper powder KU 7600 Standard does not require classification for acute inhalation toxicity. Also, according to the EC Regulation 1272/2008 and subsequent regulations, the test material does not require classification for acute inhalation toxicity.

Proposed classification for acute inhalation toxicity:

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The availability of a high quality study (Leuschner, 2011) is carried forward for the classification and the low quality study (Wesson, 2001) is rejected.

Following the conclusions from the highest quality study (Leuschner, 2011), it is concluded that copper flakes, coated with aliphatic acids, do not merit classification for acute inhalation toxicity.

Dossier Submitter's Response

Human health hazard:

The study of Wesson was judged reliable by France and by the notifier of the substance under biocide regulation.

France agrees with European copper institute that the MMAD values were around 5 µm which is superior to required MMAD in the OECD 403 guideline (1-4µm). However, this deviation is not considered as a sufficient argument to not accept the study even if France has the opinion that the hazard could thus be under-estimated.

In addition, more information on the identity of aliphatic acid coated copper flake used in the study of Leuschner should be provided to understand if differences in types of aliphatic acid or additives can explain the differences of results. However, FR considers that it does not discard the relevance of the study of Wesson that justify the proposed classification Acute Tox 3 – H331.

France proposes to keep the classification of Coated copper flake for acute inhalation endpoint.

RAC's response

RAC considers it questionable whether the factors mentioned can explain the differences in results found. The particle size may have been a little bit higher than recommended in the Wesson (2001) study, but not so high that most of the material deposited in the respiratory tract will be translocated to the gastrointestinal tract (indeed, the inhalable fraction was still 36.3-45.4%). The mean achieved test concentrations in the Wesson (2001) study were only 20-40% of the nominal concentrations and may have been variable, but they never exceeded in the dose range that was tested in the Leuschner (2011) study, where these concentrations did not result in mortality. The suggestion that zinc stearate may have been the additive in the copper flakes tested in the Wesson (2001) study also does not seem to provide an explanation for the differences observed, as zinc stearate is not hazardous (it is not currently classified for any endpoint). Without sufficient reason to discard the results of the Wesson (2001) study, RAC is in agreement with the dossier submitter to take the Wesson study as basis for the classification for acute inhalation toxicity, resulting in Acute Tox. 3 – H331.

Date	Country	Organisation	Type of Organisation	Comment number
03.02.2014	Germany	European Metal Particulates Association - a division of the German Aluminium Association	Industry or trade association	5

Comment received

ECHA note: The information below was provided in EMPA_Comments_to_the_CLH_report.pdf [attachment 1]

EMPA COMMENTS TO THE CLH REPORT:
PROPOSAL FOR HARMONIZED CLASSIFICATION

ANNEX 2 - COMMENTS AND RESPONSE TO COMMENTS ON CLH PROPOSAL ON COPPER FLAKES (COATED WITH ALIPHATIC ACID)

AND LABELLING OF COPPER FLAKES (COATED WITH ALIPHATIC ACID)

EMPA - the European Metal Particulates Association - represents 20 highly innovative companies producing non-ferrous metal powders in particularly in Europe. The production of copper flakes is part of the production portfolio of those companies. Therefore, we contribute to the public consultation on the CLH report.

Copper flakes are made for more than 150 years. Cutting edge products are unique in their various applications and ensure the global competitiveness of these SME's.

EMPA represents the industry, which is the affected industry by the CLH report on coated copper flakes as our member companies' product portfolio consists of these copper based flake products.

For reasons of responsible care and good product stewardship EMPA's members have initiated and carried out various studies to ensure production and handling of products with maximum safety and to ensure the compliance and completeness of the REACH copper dossier.

Two of the latest studies were used to substantiate the reasoning in the comments on the CLH-report on coated copper flakes handed in by the ECI and RCL.

In this context we would like to emphasize that EMPA supports the argumentation of the ECI position on the CLH report with respect to the endpoints in question (annex – already submitted by ECI).

ECI COMMENTS TO

CLH REPORT: PROPOSAL FOR HARMONIZED CLASSIFICATION AND LABELLING OF COPPER FLAKES (COATED WITH ALIPHATIC ACID)

These comments also reflect the considerations of the following task forces and consortium;

European Antifouling Copper Task Force

Wood Preservative Copper Task Force

The Copper Task Force (Plant Protection Products Regulation [PPPR])

Copper Compound Consortium

ABSTRACT

We acknowledge and appreciate the alignment with the copper risk assessment dossier as well as the incorporation of some post risk assessment data. For most endpoints, the data used and the interpretation of the data reflect the hazard profiles agreed in the copper Risk Assessment Report (RAR) and used for the copper flakes (coated with aliphatic acid) REACH dossier.

For some endpoints, we noted some differences in data-interpretation between the copper flakes (coated with aliphatic acid) CLH report and the REACH dossier. For two endpoints, new high-quality studies (Reliability 1), not yet considered in the CLH report, are available. We have therefore focused the review on these endpoints and propose to revise the classification to:

- Acute inhalation toxicity: no classification¹, based on the results of the high quality acute inhalation study from Leuschner (2011 - Attachment 1)
- Environmental hazard chronic category 2 (H 411)², when considering the results of the transformation/dissolution study from Schaefer and Klawonn (2013 – Attachment 2)

¹ CLH report proposal: Acute tox. 3 – H331

² CLH report proposal: Chronic 1 H410

1) INTRODUCTION

We appreciate the opportunity to review the CLH report but do regret the significant overlap between the public consultation period and the year-end holidays.

We acknowledge and appreciate the alignment between the CLH report and the copper risk assessment dossier as well as the incorporation of some post risk assessment data. For most endpoints, the data used and interpretation of the data reflect the hazard profiles agreed in the copper risk assessment and used for the copper REACH dossier.

We have identified two studies that are important as input to the final CLH report:

- Acute toxicity – inhalation: An, acute inhalation study on copper flakes **Wesson (2001)** was identified and used in the original REACH dossier (2010) and CLH report. Important quality issues with the Wesson (2001) study were however identified and described in the REACH 2010 dossier. Therefore, a high quality acute inhalation study was carried out (**Leuschner 2011 – Attachment 1**). These data were included in the updated REACH dossier (2013).

- In absence of transformation/dissolution data on coated copper flakes, the aquatic acute and chronic hazard profile (REACH 2010 and CLH report) was based on the ecotoxicity of soluble copper species and the surface area dependent copper release equations, defined for copper powders. Considering the uncertainty in

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defining the chronic classification (CLP 2012 guideline) at pH 7, a 28 days transformation/ dissolution test (OECD 29) was performed (**Schaefers and Klawonn, 2013 – Attachment 2**) and included in the updated REACH dossier (2013).

The studies allowed to refine the acute inhalation and environmental classifications, as described below

2) ACUTE TOXICITY – INHALATION

The two critical acute inhalation toxicity studies (Wesson 2001 and Leuschner 2011) differ substantially with respect to results, as well as their reliability and suitability for C&L purposes. The results of both experimental studies are summarised in the following table and discussed in detail below.

Table 1: Overview of experimental studies on acute toxicity after inhalation exposure

Method	Results	Remarks	Reference
rat (Sprague-Dawley) male/female inhalation (nose only) OECD Guideline 436 (Acute Inhalation Toxicity: Acute Toxic Class (ATC) Method)	LC50 (4 h): > 5.11 mg/L air (male/female) based on: test mat. (There was no evidence of respiratory tract irritation.)	1 (reliable without restriction) key study experimental result Test material (Common name): Coated copper flakes	Leuschner, J. (2011) not included in CLH report (see Attachment 1)
rat (Sprague-Dawley) male/female inhalation (nose only) OECD Guideline 403 (Acute Inhalation Toxicity)	LC50 (4 h): 1.03 mg/L air (analytical) (male/female) LC50 (4 h): 0.733 mg/L air (analytical) (male) LC50 (4 h): 1.67 mg/L air (analytical) (female)	3 (not reliable) disregarded study experimental result Test material (Common name): Coated copper flake	Wesson, CM. (2001)

Acute inhalation study 1: Wesson, CM (2001) Guideline: OECD 403, GLP: Yes:

While the study results are described in the CLH report, the report does not consider the deviation in the study.

Expert statement - Aspects of the study that question the validity of the obtained results:

a) Purity of the test substance:

This is given as 98%. However, no batch number, , or any certificate of analysis is provided, so that the sample tested is not adequately identifiable.

The inhalation toxicity study, also does not address the fatty acid stabiliser component, and to which degree it is present in the copper flakes tested. Taking the source of the material into account and the production technology at the time, the industry assumes that zinc stearate has been used as milling additive.

b) Maintenance of stable test concentrations:

Current guidance (e.g. EU method B.2, OECD 403) states that “during the exposure period, the concentration should not vary by more than $\pm 15\%$ of the mean value. However in the case of some aerosols, this level of control may not be achievable and a wider range would then be acceptable (without specifying any such wider range)”.

It is, however, noted that OECD 433 in its draft, dated June 2004, and the OECD draft guidance document No. 39, dated October 2002, state that “to prevent unnecessary repeat testing, a test atmosphere is considered acceptable for regulatory purposes if the mean of the test atmosphere samples is within $\pm 25\%$ of the concentration tested.”

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For an assessment of the stability of the test concentrations, the averages over the entire study period are calculated for each test concentration, and the percentage deviation from the average for each time point is derived, as depicted in the figure below:

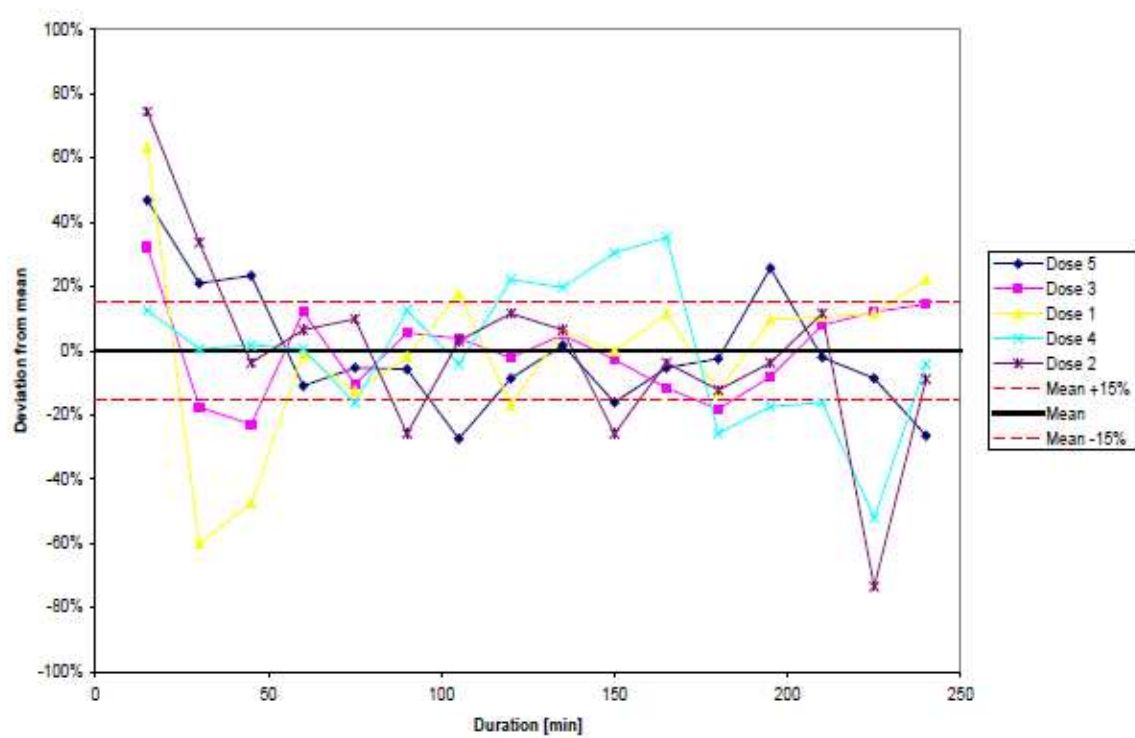


Figure 1: Variations in the atmosphere concentrations during the exposure period. Mean achieved atmosphere concentrations: group 5: 2.13 mg/L; group 3: 1.68 mg/L; group 1: 1.12 mg/L; group 4: 0.84 mg/L; group 2: 0.59 mg/L

In conclusion, the data show that the starting concentrations, only measured after 20 minutes, are very high (15-70% above the mean value) and the variation of the atmosphere concentrations, during this study, exceeded not only the ranges of $\pm 15\%$ and $\pm 25\%$ of the average, at all test concentration levels, but also at various and numerous sampling intervals. Thus, the maintenance of stable test concentrations was not according to the expectations of the test guideline.

c) Particle size tested:

Current guidance (e.g. OECD 436; 2009) explicitly requires the use of a test material, with an MMAD between 1 - 4 μm and a GSD in the range of 1.5 - 3 μm , to allow exposure of all relevant regions of the respiratory tract. The MMAD values derived in the study for each test group are as follows:

Table 2: MMAD values

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Dose group	5	3	1	4	2
MMAD	5.86	5.34	4.49	5.57	5.26
GSD	2.94	2.73	2.74	3.12	3.25

Given that the laboratory, in many cases, only achieved actual concentrations of approx. 20-30% of nominal and that the reported MMAD was around 5 µm it may easily be speculated that the test aerosol generated was not reflective of the total material but, instead, only a very minor fraction of the test material was actually transferred to the respiratory tract of the test animals.

Combined with the lack of maintaining stable test concentrations and the high starting concentration for most dose groups, this intrinsic particle-size related “fractionation” of the material, during generation of the test atmospheres, renders any conclusion based on the toxicity of the test substance unreliable.

Interpretation of results

The study demonstrates a clear lack of a dose response which limits its reliability significantly (see CLH report Table 12).

The test guideline requires that LC50 values be given separately for each sex. However, regulation (EC) 1272/2008 does not explicitly specify whether “pooled”, or data separate for each sex, should be considered. The laboratory employed “pooled” data for classification purposes (LC50 = 1.03 mg/L, classification with R20 “harmful by inhalation”). Applying a more conservative (precautionary) approach, by employing the data obtained for males (LC50 = 0.733 mg/L) for classification purposes, would require a classification with R23 “toxic by inhalation” ($1 < \text{LC50} \leq 5$ mg/L).

However, there is no apparent reason why males should behave differently to females in this context. Given the inconsistencies in the stability of the test atmospheres, with numerous exceedances of the specified tolerances for deviation from the average test concentration, the derived LC50 values are not suitable for C&L purposes.

Conclusion

The main deviations identified can be summarized as:

- no information on stability and batch no. of the tested batch are provided.
- no information on impurities is provided - the substance was tested for submission as a biocidal product and the addition of, e.g. zinc stearate, is not uncommon (see REACH dossier “copper”).
- large differences between the target and actual doses (see expert statement above).
- exceedingly high concentration at the beginning of the experiment for most concentrations.
- test aerosol generated was not reflective of the total material (see expert statement above).
- lack of clear reported dose-response.
- animals were not acclimatised to the test apparatus.

These deviations are considered to have influenced the outcome and the integrity of the study for copper coated flakes. Therefore, the study was rated with RL3 (not reliable).

As a final consequence, an appropriately designed acute inhalation toxicity study, with a well defined coated copper flakes (KU 7600 standard material), was conducted (see Leuschner, J. (2011)).

Acute inhalation study 2: Leuschner, J. (2011) Guideline: OECD 436, GLP: Yes, Deviations: None [Attachment 1]

The aim of the study was to obtain information on the acute toxicity and respiratory irritation, following a single 4-hour inhalation exposure of rats to aliphatic acid coated copper flakes (KU 7600 standard material). Rats (3m/3f each) were exposed to a dry aerosol of coated copper flakes at gravimetrically determined concentrations of 1.24 ± 0.03 and 5.11 ± 0.02 mg/L air for 4 hours by inhalation using a dynamic, nose-only exposure chamber. The aerosol was generated with the aid of a dry, rotating brush dust generator.

In the inhalation chamber, close to the animals' noses, the generated aerosol particulates had mass median aerodynamic diameters (MMAD) of 3.477 µm (1.24 or 5.11 mg/L). The Geometric Standard Deviations (GSD) of the MMADs were calculated as 2.61 or 2.77 (1.24 or 5.11 mg/L).

Mortality and general signs of toxicity

Under these test conditions, a 4-hour inhalation exposure to coated copper flakes, at concentrations of 1.24

ANNEX 2 - COMMENTS AND RESPONSE TO COMMENTS ON CLH PROPOSAL ON COPPER FLAKES (COATED WITH ALIPHATIC ACID)

or 5.11 mg/L air, did not lead to prematurely deceased animals. One of three females treated with the low concentration and two of three females treated with the high concentration showed a lower body weight gain at the end of the study (respectively +2.9%, +2.5% and +3.3% compared to the start value). Other female animals, treated with the low concentrations, showed +7.1% and +10.0%. The remaining females, treated with high concentrations, showed +6.1%.

Clinical signs

A 4-hour inhalation exposure to coated copper flakes, at concentrations of 1.24 or 5.11 mg/L air, revealed concentration-related slight to moderate ataxia, slight to moderate tremor and slight to moderate dyspnoea (reduced frequency of respiration with increased volume) on test day 1, immediately after end of exposure until 3 hours or until test day 4, in all animals, respectively (3 of 3 male and 3 of 3 female, each). In addition, reduced motility was observed in all animals, at 5.11 mg/L air 2 to 4 days after exposure.

Macroscopic changes in the nasal cavity and lungs

Dark or slight grey-stained discoloured lungs were observed in two males, at the dose level of 1.24 mg/L, or in one male and one female at the dose level of 5.11 mg/L.

Result

Under the conditions of this study, the 4-hour inhalation LC50 of coated copper flakes is >5.11 mg/L air. No evidence of respiratory tract irritation could be observed.

The test lab concluded: According to the EC-Commission directive 67/548/EC and its subsequent amendments on the approximation of the laws, regulations and administrative provision relating to the classification, packaging and labelling of dangerous substances and the results obtained under the present test conditions, Copper powder KU 7600 Standard does not require classification for acute inhalation toxicity. Also, according to the EC Regulation 1272/2008 and subsequent regulations, the test material does not require classification for acute inhalation toxicity.

Proposed classification for acute inhalation toxicity:

The availability of a high quality study (Leuschner, 2011) is carried forward for the classification and the low quality study (Wesson, 2001) is rejected.

Following the conclusions from the highest quality study (Leuschner, 2011), it is concluded that copper flakes, coated with aliphatic acids, do not merit classification for acute inhalation toxicity.

Dossier Submitter's Response

Human health hazard:

The study of Wesson was judged reliable by France and by the notifier of the substance under biocide regulation.

France agrees with European copper institute that the MMAD values were around 5 µm which is superior to required MMAD in the OECD 403 guideline (1-4µm). However, this deviation is not considered as a sufficient argument to not accept the study even if France has the opinion that the hazard could thus be under-estimated.

In addition, more information on the identity of aliphatic acid coated copper flake used in the study of Leuschner should be provided to understand if differences in types of aliphatic acid or additives can explain the differences of results. However, FR considers that it does not discard the relevance of the study of Wesson that justify the proposed classification Acute Tox 3 – H331.

France proposes to keep the classification of Coated copper flake for acute inhalation endpoint.

RAC's response

See RAC's response to comment no. 4.

OTHER HAZARDS AND ENDPOINTS – Hazardous to the Aquatic Environment

Date	Country	Organisation	Type of Organisation	Comment number
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ANNEX 2 - COMMENTS AND RESPONSE TO COMMENTS ON CLH PROPOSAL ON COPPER FLAKES (COATED WITH ALIPHATIC ACID)

03.02.2014	Finland		MemberState	6
Comment received				
<p>Comments by the Finnish Competent Authority:</p> <p>The CLH proposal includes an assumption that copper undergoes rapid removal from the water column, which is proposed to correspond to rapid environmental transformation as defined in the classification criteria. The Finnish CA considers that the provided justification for rapid environmental transformation based on the rapid removal of copper (i.e. more than 70% removal of copper from the water column within 28 days, as indicated by the TICKET-UWM model simulations), is not acceptable.</p> <p>In the CLH report, it is mentioned that "the processes considered by the model include complexation by aqueous inorganic and organic ligands such as dissolved organic carbon (DOC), adsorption to particulate phases such as particulate organic carbon (POC) and iron/manganese oxides, binding to biological receptors (biotic ligands), dissolution kinetics of metals powders, and cycling of organic matter and sulfide production in lakes"</p> <p>It is noted that the above-mentioned processes are dependent on site-specific factors and may vary spatially and temporally. Therefore, these factors cannot be used for hazard assessment which should be based on intrinsic properties of the substance and should not be dependent on local conditions.</p> <p>It is also noted that in the current published version of the CLP guidance (Guidance on the Application of the CLP Criteria Version 4.0 – November 2013) the parts concerning "rapid removal from water column" have been deleted for the time being as explained in the comment by ECHA (p.606 of the guidance).</p> <p>The section 5.5. Comparison with criteria for environmental hazard is confusing as it seems that both the classification strategy for metals and that for metal compounds seem to be used there. It is unclear whether Copper flakes is considered as metal or metal compound and therefore, the clarification for the conclusions might be needed to choose the right strategy.</p> <p>According to the metals classification strategy since there is no transformation/dissolution data for the coated copper flakes available, the surface release equation for copper powder has been used in the CLH report, giving dissolved Cu/l concentrations 0.691 and 0.836 at a loading rate of 1 mg/l. If this T/D value exceeds the acute ERV, the metal should be classified as Category Acute 1 according to classification strategies for metals (Guidance on the Application of the CLP Criteria).</p> <p>In the CLH report the lowest recorded geometric mean LC50 value was mentioned to be 0.0081 mg Cu/L for fish <i>Pimephales promelas</i> for pH 5.5-6.5. However, this value has not been used as in the table p. 175 the lowest reference value LC50 (mg/l) for pH 5.5-6.5 was claimed to be 0.0292 mg/l. It is unclear where this value comes from. Taking into account the lowest reference value of 0.0081 mg/l (<0.01) compared to 0.691-0.836 T/D values, the classification for acute hazards should be Category Acute 1, with an M-factor of 100.</p> <p>As 28 days T/D test data is not available, classification for long-term aquatic hazard for metal can be derived from the available acute ERV value according to ECHA guidance (Guidance on the Application of the CLP Criteria). Since there is no reliable evidence of rapid environmental transformation and taking into account the lowest acute ERV- value of 0.0081 mg/l (<0.01), the classification for chronic hazard should be Category chronic 1, H410, with an M-factor of 10.</p>				

ANNEX 2 - COMMENTS AND RESPONSE TO COMMENTS ON CLH PROPOSAL ON COPPER FLAKES (COATED WITH ALIPHATIC ACID)

Dossier Submitter's Response
In the current published version of the CLP guidance (Guidance on the Application of the CLP Criteria Version 4.0 – November 2013) the parts concerning "rapid removal from water column" have indeed been deleted. Moreover, as no consensus was found during the ECHA workshop on the concept of rapid removal on February 8 th , 2012, and taking into account comments from several MS (Finland, Germany, Denmark, UK) this concept might be not considered in the current assessment. The long-term classification and M factors would therefore need to be updated accordingly (see final proposal for Chronic classification and M factor at the end of this document).
RAC's response

Date	Country	Organisation	Type of Organisation	Comment number
03.02.2014	United Kingdom	Regulatory Compliance Limited	Industry or trade association	7

Comment received

Transformation/dissolution data lead to the environmental hazard class Chronic 2.

See confidential and non-confidential attachments.

ECHA note: Please see attachment no. 7.

The information below was provided in Comments to the CLH dossier copper flakes ECI Jan 2014.doc [attachment 2]

3) AQUATIC TOXICITY

The conclusions from the CLH report are based on the ecotoxicity of soluble ions, the measured surface area of the coated copper flakes and the observed relationship between the dissolved copper ions and the surface area of copper powders, exposed during transformation/dissolution tests at pH 6. The data suggest that full solubility can be assumed at pH 6.

- Assuming full solubility at pH 6, the chronic ERV of 0.02 mg dissolved Cu/L results in an environmental classification as Chronic 2 with "removal from the water-column".
- If full solubility would be assumed at pH 7, the chronic ERV of 0.007 mg/L could potentially lead to a classification as Chronic 1 (ratio of 1.3), with "removal from the water-column".

In the absence of actual transformation/dissolution data of powders at pH 7, the CLH report considered 100% solubility at pH7 and concluded on a worst case environmental classification: Chronic 1 (M=1)

Considering the pH dependent release of copper (Figure 2), the pH 7 classification may also lead to "Chronic 2".

ANNEX 2 - COMMENTS AND RESPONSE TO COMMENTS ON CLH PROPOSAL ON COPPER FLAKES (COATED WITH ALIPHATIC ACID)

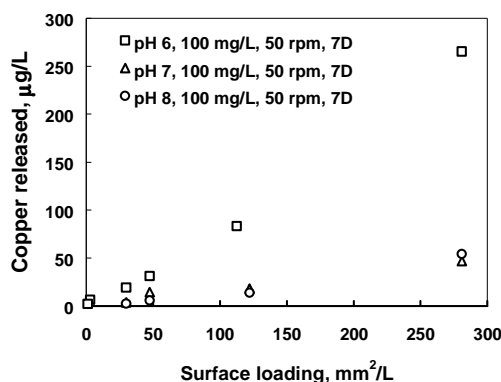


Figure 2 : Copper released from 7days transformation/dissolution of various copper wire pieces, at different surface loadings and pH

To resolve this remaining uncertainty, transformation/dissolution tests on the coated copper flakes were carried out at pH 6 and pH 7 (C. Schaefer, 2013 – Attachment 2).

Transformation/dissolution study: C. Schaefer, 2013

A transformation/dissolution, according to OECD guidance document 29 (2001), on coated copper flakes (KU 7600 Standard Material; D50: 9-11 µm) was performed.

The test was conducted in test media at pH 6 and pH 7 with a loading of 1 mg/L in triplicate vessels (agitation at 100 rpm, 21.5 ± 1.5 °C) and duplicate samples per vessel.

Solutions were sampled after 2 h, 6 h, 24 h (1 d), 96 h (4 d) and 168 h (7 d), 336h (14 d) and 672h (28 d).

Final results:

The observed levels and variations in temperature, pH and O₂ concentrations are in compliance with the test guideline. The observed intra- and inter-vessel variations in dissolved copper concentrations are in compliance with the test guideline.

Plots of time vs. total copper concentrations at pH 6 and pH 7 are shown in figure 3 and figure 4. The results can be summarised as:

- Following 7 days transformation/dissolution tests, with 1 mg copper flakes/l at pH 6 and 7, mean copper concentrations of respectively 0.721 mg/L and 0.363 mg/L were recorded.
- Following 28 days transformation/dissolution tests, with 1 mg copper flakes/l at pH 6 and 7, mean copper concentrations of respectively 0.745 mg/L and 0.632 mg/L were recorded.
- At pH 6 and pH 7, solubility equilibriums have been reached after 168 h (7 d) - 504 h (21 d) and 336 h (14 d) - 672 h (28 d) because three subsequent total dissolved metal concentration data points vary no more than 15 % [OECD 29]. Under the described conditions of this test, with Copper Powder KU 7600 Standard Material and a loading of 1 mg/L, the dissolved mean copper equilibrium concentrations were 772.6 ± 41.1 µg/L and 639.4 ± 34.3 µg/L and, at pH 6 and pH 7, respectively.

ANNEX 2 - COMMENTS AND RESPONSE TO COMMENTS ON CLH PROPOSAL ON COPPER FLAKES (COATED WITH ALIPHATIC ACID)

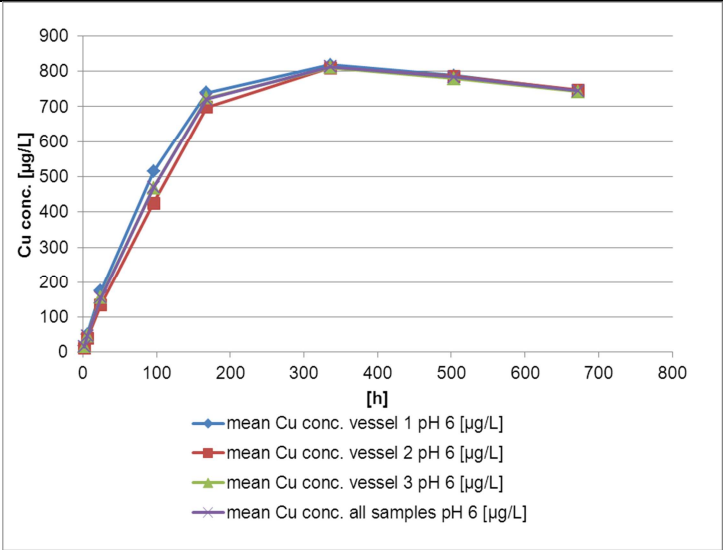


Figure 3: Time vs. copper concentration at pH 6

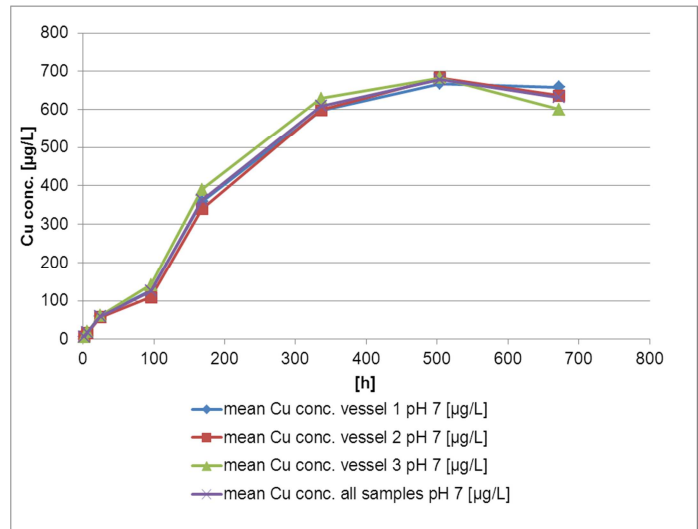


Figure 4: Time vs. copper concentration at pH 7

The following data are retained for the hazard classification

- At pH 6: at a loading of 1 mg/L, the dissolved mean copper concentrations at day 7 (acute) and at equilibrium (chronic) were respectively 0.721 mg/l and 0.773 mg/l.
- At pH 7: at a loading of 1 mg/L, dissolved mean copper concentrations at day 7 (acute) and at equilibrium (chronic) were respectively 0.363 mg/l and 0.639 mg/l.

Ecotoxicity data

The ERVs, retained in the CLH report, are taken from the Risk Assessment Report (RAR). They are slightly higher than the ones defined in the REACH dossier (2010 and 2013) because, in the RAR, geometric mean values were derived, also when only 2 and 3 data-points per species were available. In the REACH report, the geometric mean was only applied if 4 or more data-points are available. This refinement slightly lowered some species-specific reference values (more information from Van Sprang and Delbeke, 2010 - Attachment 3). Table 3 summarises the ERVs, retained from the RAR/CLH and REACH reports, expressed as mg dissolved copper-ions/L.

Table 3: Summary of the acute and chronic ERVs for copper, expressed as mg dissolved Cu/L)

ANNEX 2 - COMMENTS AND RESPONSE TO COMMENTS ON CLH PROPOSAL ON COPPER FLAKES (COATED WITH ALIPHATIC ACID)

Source	pH range	Acute ERV Cu	Chronic ERV Cu
RAR/CLH	5.5-6.5	0.029	0.020
	>6.5-7.5	0.047	0.007
	>7.5-8.5	0.030	0.016
REACH	5.5-6.5	0.025	0.020
	>6.5-7.5	0.035	0.007
	>7.5-8.5	0.030	0.011
	across all pHs	0.034	0.015

Note: In the RAR and the REACH dossier, the ecotoxicity data from *P. promelas* at pH 6 (Erickson et al., 1996) were rejected and it may be clarifying to also mention this in the CLH report.

The test was performed with larvae (< 24 h old) in a flow-through with a very short retention time (\pm 45 min.), using a diluted reconstituted medium (prepared from Lake Superior water through reverse osmosis) with a low hardness (22 mg/l CaCO₃) and DOC concentration (reverse osmosis). This test represents worst case conditions, explaining therefore this low LC₅₀ value. Moreover, the pH dependency observed for *P. promelas* (sensitivity at pH 6 versus pH 7) is unexpected and may be related to insufficient adaptation to low pH conditions (from Van Sprang and Delbeke, 2010 - Attachment 3).

Conclusions and consequences for classification

Considering the availability of transformation/dissolution data at pH 6 and pH 7, these can be used to confirm or refine the classification (Table 4). In addition, for comparison purposes, the classification versus solubility for copper compounds and copper flake is presented in Attachment 4 for completeness.

Table 4: Comparison between transformation/dissolution data at pH 6 and pH 7 and acute and chronic ERVs for copper, expressed as mg dissolved Cu/L). Transformation/dissolution tests were carried out at 1 mg/l and calculated for 0.01 and 0.01 mg/L by linear extrapolation from the data at 1 mg/l loading.

Transformation/dissolution				
Loading [mg Cu/l]	Time [days]	mg dissolved Cu/l		
		At pH 6	At pH 7	At pH 8
1	7	0.721	0.363	1 (not tested)
0.1 (extrapolated)		0.072	0.036	0.1
0.01 (extrapolated)		0.007	0.004	0.01
1	28	0.773	0.639	1 (not tested)
0.1 (extrapolated)		0.077	0.064	0.1
0.01 (extrapolated)		0.008	0.006	0.01
Additional data: Ecotoxicity Reference Values - mg dissolved Cu/ l				
Acute ERV	LC ₅₀	0.029 (0.025)	0.047 (0.035)	0.030
Chronic ERV	NOEC	0.020	0.007	0.016 (0.0114)

The results from the transformation/dissolution test confirm the proposed aquatic acute classification:

- At pHs 6 and 7, at a loading of 1 mg/L, dissolved mean copper concentration after 7 days

ANNEX 2 - COMMENTS AND RESPONSE TO COMMENTS ON CLH PROPOSAL ON COPPER FLAKES (COATED WITH ALIPHATIC ACID)

transformation/dissolution are between 0.363 and 0.721 mg/L. Linear extrapolation of the dissolved copper concentrations from a loading of 1 mg/L to lower loadings³, are shown in Table 4. Comparison of the dissolved copper concentrations (after 7 days transformation/dissolution) and the acute ERVs shows that at a loading >0.1 mg/L, dissolved concentration are above the ERVs while at 0.01 mg/L, the dissolved concentrations are below the ERVs. The data therefore confirm the aquatic hazard class **Acute 1; M factor =10** classification proposal of the CLH report.

For chronic toxicity, there is evidence of rapid removal from water column. The results from the transformation/dissolution tests allow refinement of the aquatic chronic classification:

- At pH 6: at a loading of 1 mg/L, the dissolved mean copper equilibrium concentration was 0.773 mg/L. Linear extrapolation of the dissolved copper concentrations from a loading of 1 mg/L to lower loadings³, leads to dissolved concentrations of 0.077 mg/L and 0.008 mg/L at respectively 0.1 mg/L and 0.01 mg/L. The lowest chronic ERV at pH 6 is 0.020 mg Cu/L.

Chronic aquatic toxicity (higher dissolved concentrations compared to the ERV) would thus be triggered at loadings between 0.1 mg/L and 0.01 mg/L.

- At pH 7: at a loading of 1 mg/L, the dissolved mean copper equilibrium concentration was 0.639 mg/L. Linear extrapolation of the dissolved copper concentrations from a loading of 1 mg/L to lower loadings³, leads to dissolved concentrations of 0.064 mg/L and 0.006 mg/L at respectively 0.1 mg/L and 0.01 mg/L loadings. The lowest chronic ERV at pH 6 is 0.007 mg Cu/L.

Chronic aquatic toxicity (higher dissolved concentrations compared to the ERV) would thus be triggered at loadings between 0.1 mg/L and 0.01 mg/L.

- At pH 8, no transformation/dissolution tests were carried out. Worst-case pH 6 transformation/dissolution data, or even full solubility (0.773 or 1 mg/L and by extrapolation 0.077 at 0.1 mg/L and 0.007 at 0.01 mg/L) are thus considered. The lowest chronic ERV at this pH is 0.016 mg Cu/L, and leads to chronic aquatic toxicity at loadings between 0.1 mg/L and 0.01 mg/L.

The transformation/dissolution data therefore lead to the environmental hazard class **Chronic 2**.

4) RELEVANT ATTACHMENTS

Attachment 1: Leuschner, 2011

Attachment 2: Schaefer and Klawonn, 2013

Attachment 3: Van Sprang and Delbeke, 2010

Attachment 4: Classification versus solubility for copper compounds and copper flake

CONTACTS

For more information, please contact:

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Carol Mackie *Secretariat of the Copper Compound Consortium*, Regulatory Compliance Ltd, 6 Dryden Road, Bilston Glen, Loanhead, Midlothian, EH20 9LZ. Tel: +44(0)131 448 1086, cmackie@regcs.co.uk

Dossier Submitter's Response

³ To allow sufficient reproducibility of the results, in accordance to footnote 64 of the CLP guidance, tests were carried out at 1 mg/L. The validity of linear extrapolation is noted from Figure 2.

ANNEX 2 - COMMENTS AND RESPONSE TO COMMENTS ON CLH PROPOSAL ON COPPER FLAKES (COATED WITH ALIPHATIC ACID)

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RAC's response

Date	Country	Organisation	Type of Organisation	Comment number
03.02.2014	Germany	European Metal Particulates Association - a division of the German Aluminium Association	Industry or trade association	8
Comment received				
<p><i>ECHA note: The information below was provided in EMPA_Comments_to_the_CLH_report.pdf [attachment 1]</i></p> <p>3) AQUATIC TOXICITY</p> <p>The conclusions from the CLH report are based on the ecotoxicity of soluble ions, the measured surface area of the coated copper flakes and the observed relationship between the dissolved copper ions and the surface area of copper powders, exposed during transformation/dissolution tests at pH 6. The data suggest that full solubility can be assumed at pH 6.</p> <ul style="list-style-type: none"> Assuming full solubility at pH 6, the chronic ERV of 0.02 mg dissolved Cu/L results in an environmental classification as Chronic 2 with "removal from the water-column". If full solubility would be assumed at pH 7, the chronic ERV of 0.007 mg/L could potentially lead to a classification as Chronic 1 (ratio of 1.3), with "removal from the water-column". <p>In the absence of actual transformation/dissolution data of powders at pH 7, the CLH report considered 100% solubility at pH7 and concluded on a worst case environmental classification: Chronic 1 (M=1) Considering the pH dependent release of copper (Figure 2), the pH 7 classification may also lead to "Chronic 2".</p>				

ANNEX 2 - COMMENTS AND RESPONSE TO COMMENTS ON CLH PROPOSAL ON COPPER FLAKES (COATED WITH ALIPHATIC ACID)

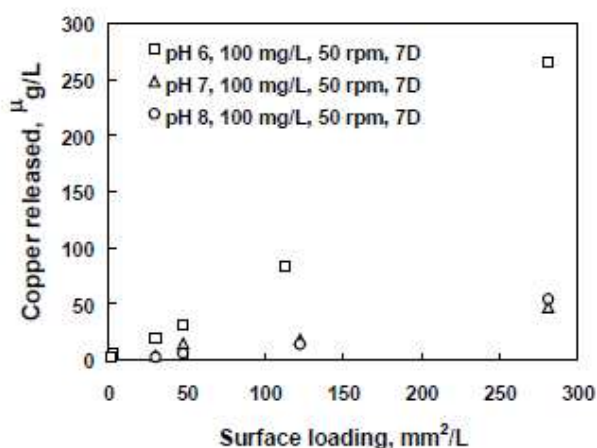


Figure 2 : Copper released from 7days transformation/dissolution of various copper wire pieces, at different surface loadings and pH

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Transformation/dissolution study: C. Schaefer, 2013

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The test was conducted in test media at pH 6 and pH 7 with a loading of 1 mg/L in triplicate vessels (agitation at 100 rpm, 21.5 ± 1.5 °C) and duplicate samples per vessel.

Solutions were sampled after 2 h, 6 h, 24 h (1 d), 96 h (4 d) and 168 h (7 d), 336 h (14 d) and 672 h (28 d).

Final results:

The observed levels and variations in temperature, pH and O₂ concentrations are in compliance with the test guideline. The observed intra- and inter-vessel variations in dissolved copper concentrations are in compliance with the test guideline.

Plots of time vs. total copper concentrations at pH 6 and pH 7 are shown in figure 3 and figure 4. The results can be summarised as:

- Following 7 days transformation/dissolution tests, with 1 mg copper flakes/l at pH 6 and 7, mean copper concentrations of respectively 0.721 mg/L and 0.363 mg/L were recorded.
- Following 28 days transformation/dissolution tests, with 1 mg copper flakes/l at pH 6 and 7, mean copper concentrations of respectively 0.745 mg/L and 0.632 mg/L were recorded.
- At pH 6 and pH 7, solubility equilibriums have been reached after 168 h (7 d) - 504 h (21 d) and 336 h (14 d) - 672 h (28 d) because three subsequent total dissolved metal concentration data points vary no more than 15 % [OECD 29]. Under the described conditions of this test, with Copper Powder KU 7600 Standard Material and a loading of 1 mg/L, the dissolved mean copper equilibrium concentrations were 772.6 ± 41.1 µg/L and 639.4 ± 34.3 µg/L and, at pH 6 and pH 7, respectively.

ANNEX 2 - COMMENTS AND RESPONSE TO COMMENTS ON CLH PROPOSAL ON COPPER FLAKES (COATED WITH ALIPHATIC ACID)

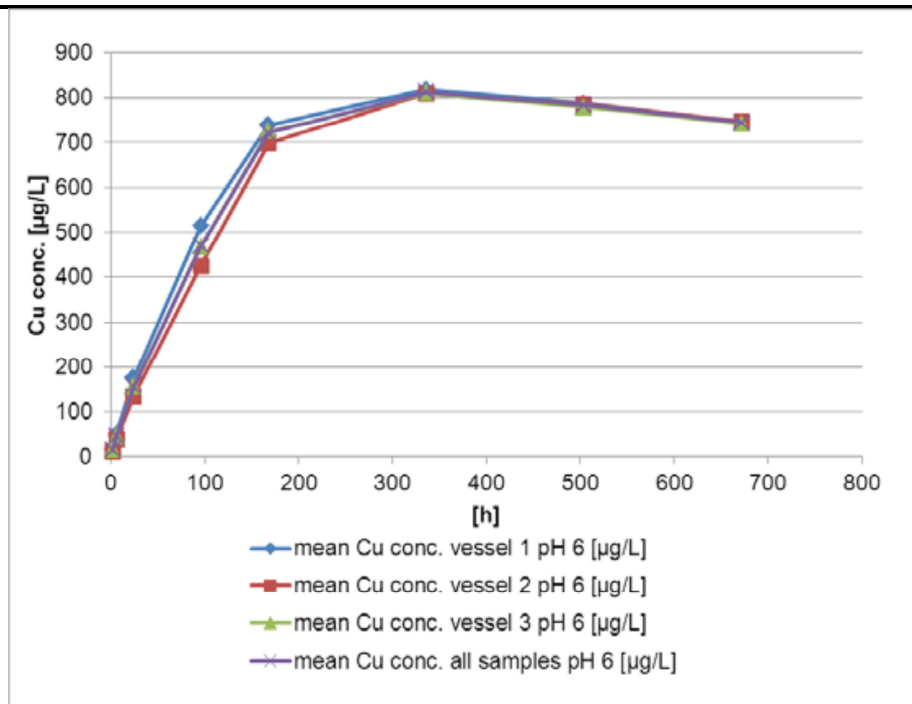


Figure 3: Time vs. copper concentration at pH 6

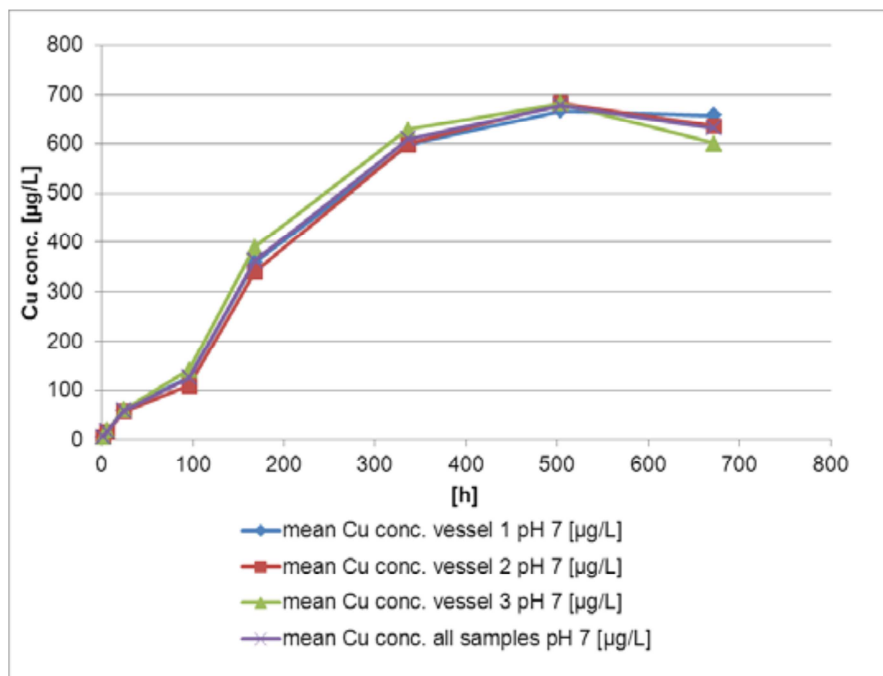


Figure 4: Time vs. copper concentration at pH 7

The following data are retained for the hazard classification

- At pH 6: at a loading of 1 mg/L, the dissolved mean copper concentrations at day 7 (acute) and at equilibrium (chronic) were respectively 0.721 mg/l and 0.773 mg/l.
- At pH 7: at a loading of 1 mg/L, dissolved mean copper concentrations at day 7 (acute) and at equilibrium

ANNEX 2 - COMMENTS AND RESPONSE TO COMMENTS ON CLH PROPOSAL ON COPPER FLAKES (COATED WITH ALIPHATIC ACID)

(chronic) were respectively 0.363 mg/l and 0. 639 mg/l.

Ecotoxicity data

The ERVs, retained in the CLH report, are taken from the Risk Assessment Report (RAR). They are slightly higher than the ones defined in the REACH dossier (2010 and 2013) because, in the RAR, geometric mean values were derived, also when only 2 and 3 data-points per species were available. In the REACH report, the geometric mean was only applied if 4 or more data-points are available. This refinement slightly lowered some species-specific reference values (more information from Van Sprang and Delbeke, 2010 - Attachment 3). Table 3 summarises the ERVs, retained from the RAR/CLH and REACH reports, expressed as mg dissolved copper-ions/L.

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Source	pH range	Acute ERV Cu	Chronic ERV Cu
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	>7.5-8.5	0.030	0.016
REACH	5.5-6.5	0.025	0.020
	>6.5-7.5	0.035	0.007
	>7.5-8.5	0.030	0.011
	across all pHs	0.034	0.015

Note: In the RAR and the REACH dossier, the ecotoxicity data from *P. promelas* at pH 6 (Erickson et al., 1996) were rejected and it may be clarifying to also mention this in the CLH report.

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Conclusions and consequences for classification

Considering the availability of transformation/dissolution data at pH 6 and pH 7, these can be used to confirm or refine the classification (Table 4). In addition, for comparison purposes, the classification versus solubility for copper compounds and copper flake is presented in Attachment 4 for completeness.

Table 4: Comparison between transformation/dissolution data at pH 6 and pH 7 and acute and chronic ERVs for copper, expressed as mg dissolved Cu/L). Transformation/dissolution tests were carried out at 1 mg/l and calculated for 0.01 and 0.01 mg/L by linear extrapolation from the data at 1 mg/l loading.

ANNEX 2 - COMMENTS AND RESPONSE TO COMMENTS ON CLH PROPOSAL ON COPPER FLAKES (COATED WITH ALIPHATIC ACID)

Transformation/dissolution				
Loading [mg Cu/l]	Time [days]	mg dissolved Cu/l		
		At pH 6	At pH 7	At pH 8
1	7	0.721	0.363	1 (not tested)
0.1 (extrapolated)		0.072	0.036	0.1
0.01 (extrapolated)		0.007	0.004	0.01
1	28	0.773	0.639	1 (not tested)
0.1 (extrapolated)		0.077	0.064	0.1
0.01 (extrapolated)		0.008	0.006	0.01
Additional data: Ecotoxicity Reference Values - mg dissolved Cu/ l				
Acute ERV	LC ₅₀	0.029 (0.025)	0.047 (0.035)	0.030
Chronic ERV	NOEC	0.020	0.007	0.016 (0.0114)

The results from the transformation/dissolution test confirm the proposed aquatic acute classification:

- At pHs 6 and 7, at a loading of 1 mg/L, dissolved mean copper concentration after 7 days transformation/dissolution are between 0.363 and 0.721 mg/L. Linear extrapolation of the dissolved copper concentrations from a loading of 1 mg/L to lower loadings³, are shown in Table 4. Comparison of the dissolved copper concentrations (after 7 days transformation/dissolution) and the acute ERVs shows that at a loading >0.1 mg/L, dissolved concentration are above the ERVs while at 0.01 mg/L, the dissolved concentrations are below the ERVs. The data therefore confirm the aquatic hazard class **Acute 1; M factor =10** classification proposal of the CLH report.

³ To allow sufficient reproducibility of the results, in accordance to footnote 64 of the CLP guidance, tests were carried out at 1 mg/L. The validity of linear extrapolation is noted from Figure 2.

For chronic toxicity, there is evidence of rapid removal from water column. The results from the transformation/dissolution tests allow refinement of the aquatic chronic classification:

- At pH 6: at a loading of 1 mg/L, the dissolved mean copper equilibrium concentration was 0.773 mg/L. Linear extrapolation of the dissolved copper concentrations from a loading of 1 mg/L to lower loadings³, leads to dissolved concentrations of 0.077 mg/L and 0.008 mg/L at respectively 0.1 mg/L and 0.01 mg/L. The lowest chronic ERV at pH 6 is 0.020 mg Cu/L.

Chronic aquatic toxicity (higher dissolved concentrations compared to the ERV) would thus be triggered at loadings between 0.1 mg/L and 0.01 mg/L.

- At pH 7: at a loading of 1 mg/L, the dissolved mean copper equilibrium concentration was 0.639 mg/L. Linear extrapolation of the dissolved copper concentrations from a loading of 1 mg/L to lower loadings³, leads to dissolved concentrations of 0.064 mg/L and 0.006 mg/L at respectively 0.1 mg/L and 0.01 mg/L loadings. The lowest chronic ERV at pH 6 is 0.007 mg Cu/L.

Chronic aquatic toxicity (higher dissolved concentrations compared to the ERV) would thus be triggered at loadings between 0.1 mg/L and 0.01 mg/L.

- At pH 8, no transformation/dissolution tests were carried out. Worst-case pH 6 transformation/dissolution data, or even full solubility (0.773 or 1 mg/L and by extrapolation 0.077 at 0.1 mg/L and 0.007 at 0.01 mg/L) are thus considered. The lowest chronic ERV at this pH is 0.016 mg Cu/L, and leads to chronic aquatic toxicity at loadings between 0.1 mg/L and 0.01 mg/L.

The transformation/dissolution data therefore lead to the environmental hazard class **Chronic 2**.

4) RELEVANT ATTACHMENTS

Attachment 1: Leuschner, 2011

Attachment 2: Schaefer and Klawonn, 2013

Attachment 3: Van Sprang and Delbeke, 2010

Attachment 4: Classification versus solubility for copper compounds and copper flake

CONTACTS

For more information, please contact:

ANNEX 2 - COMMENTS AND RESPONSE TO COMMENTS ON CLH PROPOSAL ON COPPER FLAKES (COATED WITH ALIPHATIC ACID)

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ECHA note: The information below was provided in Classification versus pH and solubility.doc [attachment 3]

ECI ATTACHMENT (2)

FOR INFORMATION - CLASSIFICATION VERSUS SOLUBILITY FOR COPPER COMPOUNDS AND COPPER FLAKE

This paper also reflects the considerations of the following task forces and consortium;

European Antifouling Copper Task Force

Wood Preservative Copper Task Force

The European Union Copper Task Force (Plant Protection Products Regulation [PPPR])

Copper Compound Consortium

1) INTRODUCTION

Following the review of the ANSES CLH documents for copper compounds and copper flakes, ECI in collaboration with the various copper task forces⁴ would like to raise the following discussion as applicable to all the available compounds under consideration.

The ecotoxicity reference values (ERVs) for copper/copper compounds are based on the reliable/relevant ecotoxicity tests carried out with soluble copper compounds (e.g. CuSO₄, CuCl) and retained in the copper risk assessment. The test results (e.g. LC₅₀) from various compounds are combined and expressed as soluble copper ions (RAR and Van Sprang and Delbeke, 2010). For classification purposes, the ERV values are obtained after data-aggregation and translation to the respective copper compounds using a molecular weight translation (soluble compounds) or using the results of the transformation/dissolutions (sparingly soluble copper compounds, copper powders and copper massives). Therefore, consistency in classification across copper/copper compounds can be assessed based in information of molecular weight and solubility (see Table 1). From Table 1, the highest classification of CuSO₄ is thus expected. In addition, the available data in the CLH reports and transformation dissolution (TD) data also show that the solubility of all the other compounds including copper flakes currently under consideration is dependent on pH.

Table 1: Solubility of copper compound/flakes across the pH range tested

a) Standard OECD solubility testing

Compound	pH range				Source
	5.5-6.5	>6.5-7.5	>7.5-8.5	>8.5-10	
	Solubility (mg/L)				
CuSO4.5H2O	220000				1

⁴ European Antifouling Copper Task Force; Wood Preservative Copper Task Force; The European Union Copper Task Force (Plant Protection Products Regulation [PPPR]); Copper Compound Consortium

ANNEX 2 - COMMENTS AND RESPONSE TO COMMENTS ON CLH PROPOSAL ON COPPER FLAKES (COATED WITH ALIPHATIC ACID)

BCC	-	4.68	-	0.01	1
Bordeaux Mixture	-	2.2	-	1.1	1
Cu₄(OH)₆(SO₄)	3.42	-	-	0.255	1
CuSCN	-	2.3	-	0.12	1
CuOCl	1.19	-	-	0.525	1
CuOH	-	0.9318	-	0.0066	1
Cu₂O	-	0.639	-	0.539	1
Copper flakes*	-	0.27**	-	0.13	2
CuO	0.394	-	-	0.01	1

b) Transformation/dissolution testing

Compound	pH range				Source
	5.5-6.5	>6.5-7.5	>7.5-8.5	>8.5-10	
	Solubility (mg/L)				
Cu2O	0.236	0.098	<1	-	3
Copper flakes	0.721	0.363	-	-	4
CuO	0.049	0.005	0.00	-	5

Key

* Data at pH 4 was reported as 192 mg/L but not presented in table as this was more likely to reflect the oxido-reduction reaction of the copper metal into ionic copper [Cu(0) → Cu(I) → Cu (II)] which is promoted at low pH.

**Carried out at 20°C at 30°C 0.32 mg/L was reported

1 - Endpoints taken from standard OECD solubility studies see Section 5.6 of CLH report from ANSES

2 - Endpoints taken from standard OECD solubility studies see Section 1.3; Table 9 of CLH report from ANSES

3 - Results from T/D study reported for ISO 6341. Data presented to the 2001 'Meeting on environmental effects' part of the Commission Working Group on the Classification and Labelling of Dangerous Substances ref: ECBI/61/95 Add. 135.

4 - Schaefer and Klawonn (2013) data provided by ECI within commenting document to CLH

5 - Rodriguez et al., 2000 - data presented in REACH 2013 updates and available in Report available from the copper RAR (2008) (Annex K3)

The overall impact of solubility on the classification proposals by the CLH report across all the compounds and copper flakes can be seen in see Table 2 in addition the classifications as proposed by ECI and task force commenting documents.

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Table 2: ECI Proposed Classification of copper compounds and copper flake across pH

Compound	Classification	Proposed CLH	Proposed by ECI at pH range			Proposed ECI
			5.5-6.5	>6.5-7.5	>7.5-8.5	
CuSO ₄	Acute	1	1	1	1	1
	M-Factor	10	10	10*	10	10
	Chronic	2	2	2	2	2
	M-Factor	-	-	-	-	-
BCC	Acute	1	1	1	1	1
	M-Factor	10	10	10	10	10
	Chronic	2	2	2	2	2
	M-Factor	-	-	-	-	-
Bordeaux Mixture	Acute	1	1	1	1	1
	M-Factor	10	10	10	10	10
	Chronic	2	2	2	2	2
	M-Factor	-	-	-	-	-
Cu ₄ (OH) ₆ (SO ₄)	Acute	1	1	1	1	1
	M-Factor	10	10	10	10	10
	Chronic	2	2	2	2	2
	M-Factor	-	-	-	-	-
CuSCN	Acute	1	1	1	1	1
	M-Factor	10	10	10	10	10
	Chronic	2	2	2	2	2
	M-Factor	-	-	-	-	-
CuOCl	Acute	1	1	1	1	1
	M-Factor	10	10	10	10	10
	Chronic	2	2	2	2	2
	M-Factor	-	-	-	-	-
CuOH	Acute	1	1	1	1	1
	M-Factor	10	10	10	10	10
	Chronic	1	2	2	2	2
	M-Factor	1	-	-	-	-
Cu ₂ O	Acute	1	1	1	1	1
	M-Factor	100**	10	10	10	10
	Chronic	1	2	2***	2	2
	M-Factor	1	-	-	-	-
Copper flake	Acute	1	1	1	1	1
	M-Factor	10	10	10	10	10
	Chronic	1	2	2	n/c	2
	M-Factor	1	-	-	-	-
CuO	Acute	1	1	1	1	1
	M-Factor	10	1	1	1	1
	Chronic****	1	2	3	n/c	2
	M-Factor	1	-	-	-	-

Solubility

n/c – Not Classified

*M=1 for RAR data with ERV of 0.119 mg/l

** considered to be an error introduced to CLH document by ANSES (see individual commenting document)

*** judgment made since compound is of relative low solubility and ERV of 0.008 mg/l is borderline, Chronic 1 is considered an over prediction when comparing toxicity with soluble data of CuSO₄

**** Calculated from 28 d TD study by dividing 1 mg/l result by factor of 10

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2) OVERALL CONCLUSION

The ERV values for copper and copper compounds for both acute and chronic environmental endpoints have historically been derived using high quality ecotoxicity studies using soluble copper compounds. This ensures that consistent ERV values are derived across compounds. This consistent ERV allows to compare classification based on potential bioavailability, according to the results of solubility studies (derived using OECD guidelines or by transformation/dissolution). Using this proposal, the most soluble copper compounds would carry the most stringent environmental classification (see Table 2).

CONTACTS

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Dossier Submitter's Response

In the current published version of the CLP guidance (Guidance on the Application of the CLP Criteria Version 4.0 – November 2013) the parts concerning "rapid removal from water column" have indeed been deleted. Moreover, as no consensus was found during the ECHA workshop on the concept of rapid removal on February 8th, 2012, and taking into account comments from several MS (Finland, Germany, Denmark, UK) this concept might be not considered in the current assessment. The long-term classification and M factors would therefore need to be updated accordingly (see final proposal for Chronic classification and M factor at the end of this document).

RAC's response

Date	Country	Organisation	Type of Organisation	Comment number
03.02.2014	United Kingdom		MemberState	9
Comment received				
<p>It is important to note that our comments reflect the general classification approach used for the range of copper compounds and are not specific to individual substances.</p> <p>Many of the copper compound CLH Reports refer extensively to biocide CARs or pesticide DARs. Whilst we appreciate the time since the reports were initially prepared, we note that a more recent EFSA opinion and agreed endpoints for pesticidal uses of copper (dated 2013) than the one referred to (2008) is available. The authors may wish to consider the final agreed key endpoints and data gaps identified by EFSA (along with more recent biocide reviews) to see if there are any significant changes or new data.</p> <p>For all the copper compounds, it would help to be clear throughout the reports whether they are referring to the whole technical substance in question, the pure substance, total copper, or dissociated ionic copper (Cu²⁺). This is important when it comes to how the exposure and (eco)toxicity units are presented. Wherever units are quoted (e.g. µg/L), it should say in what form that copper is expressed.</p>				

It is useful to have noted that nano-forms of Cu exist - and we agree with the suggestion that these are considered separately pending further information on representivity/read-across of the existing bulk Cu data. This would be a useful principle to note for all future substances where nano-forms also exist and we feel this distinction should also appear in the final

Environmental fate assessment

Much of the env.fate section attempts to equate removal of dissolved ionic copper from the water phase with the rapid degradation criterion for organic substances of >70% degradation in 28 days. It is noted in the reports that transformation of one metal 'species' to another does not equate with degradation of an organic substance and that (bio)availability of the different forms of copper is a key consideration. The current ECHA CLP Guidance for metals (Annex IV) focuses mainly on exposure to metals and metal compounds dissolved in the water phase and on transformation processes that occur only within the water column. The focus in the guidance is on determining 'rapid environmental transformation'. However, it does suggest that it may be possible to incorporate other processes such as water-column residence times, deposition and subsequent re-mobilisation. Whilst the copper CLH reports clearly attempt to do this, there is currently no standard means of incorporating removal, e.g. to dissolved organic carbon (DOC) or sediment, within the hazard classification system for organic or inorganic substances.

The approach used in the reports to indicate rapid environmental transformation or removal relies on a number of assumptions which are not well supported; for example:

- It assumes that there is sediment present to act as a 'sink' for copper, which may not always be the case.
- It is not always clear what form the initial loading comprised in each case - was it already as dissolved Cu^{2+} and if so, can the model (and fate studies) account for different loading rates and the different forms of copper discussed here (which presumably initially dissociate at different rates)?
- The main scenario discussed is a generalized 3 m deep lake situation. Lakes are usually large, static, permanent and have sediment of some description, however this may not reflect many other EU surface water bodies such as ponds, rivers and streams - where increased water movement, turbidity, less sediment, different depths, etc.. could affect the amount of copper remaining in solution or suspension. We therefore wonder whether a 'realistic worst case' situation has indeed been modelled?
- With various adjustments, e.g. to settling velocity, suspended solids, the TICKET-UWM model appears able to reflect the fate of copper in some (not all) of the available field/semi-field tests. However, it is not then used to extrapolate to other water body types with very different characteristics. We think this should be the main point of the modelling, to add value to the existing field data set, rather than to simply interpret it.
- Where there was continuous 'post-loading' in the MELIMEX experiment, this was more difficult to model and indicated that the rapid removal benchmark was not met. In the 'real-world' there may be continuous or repeated exposures, particularly of larger water bodies, from multiple sources. The chronic criteria (+ M-factor) are meant to address hazards over a longer time period than just a few days - so, for hazard classification purposes we would expect rapid transformation/removal to be able to cover the majority of situations, not just one-off exposures.
- The reports considers that most copper reaches the sediment, where much of this is then locked up in different forms (especially with sulphides) and is no longer available. This relies upon the assumption that most sediment, if present, is anaerobic and this process is fairly instantaneous. In reality, the top layers of sediment might well be aerobic - and the

ANNEX 2 - COMMENTS AND RESPONSE TO COMMENTS ON CLH PROPOSAL ON COPPER FLAKES (COATED WITH ALIPHATIC ACID)

transit and mixing time with more anaerobic layers will vary according to the water body and sediment type, as well as temporally and spatially. Is this variability covered? Are the levels of sulphide assumed in the model (based on the Flanders data set) representative of other EU water bodies? Also, what happens if the sediment is already contaminated with metals, is there always enough 'spare' AVS left or will there be cases where it is already saturated so not available for new metal?

Because of these difficulties in describing and modelling all (or even one) relevant/realistic 'worst case' scenario for removal to sediment or to DOC/POC - such mitigating factors are rarely used to refine the hazard classification for organic substances. Most tests for organic substances in fact try to minimise such removal mechanisms to make them as bioavailable as possible, therefore taking account of this for metals would be inconsistent with usual practice. Ready biodegradability tests are difficult to pass, so metal transformation/removal should also face a similarly stringent test. Because of this, we cannot currently support the claim of rapid removal of copper based on the evidence in the dossiers.

On bioaccumulation; we agree this is probably not an issue, provided internal homeostatic excretion, transformation and detoxification mechanisms can always regulate levels within organisms under realistic worst case exposure conditions. Could the bioaccumulation potential of copper be related to the standard CLP triggers in a similar way as attempted for rapid degradation?

Ecotoxicity assessment

It isn't always clear why some ecotoxicological endpoints (e.g. from the DAR) are quoted for some forms of copper but not others. They're not just the worst case values and it's not always clear between the various reports why they've been selected and how they're treated. Whilst there may be limitations to what was measured and reported in the studies and DAR, some endpoints appear as both total and dissolved Cu, as nominal or measured. Could these all be adjusted and expressed in the same consistent way? The form in which data from the EU Voluntary Risk Assessment Report (VRAR) are expressed is also unclear in the tables (dissolved copper?).

The separation of the VRAR endpoints into the different pH ranges is potentially useful, although there is no explanation why the particular bands have been chosen and only the lowest values are selected anyway, which makes it unclear why the separation was performed in the first place. There is also no discussion of the impact of other water quality parameters (e.g. hardness) on toxicity. Ultimately, at least for some of the substances, the DAR endpoints are preferred anyway - so it is not always clear what role the VRAR data have. As mentioned, these data have never been considered by a 'technical group competent for classification' and there is uncertainty over transformation/dissolution of some of the substances. It might therefore be useful to present more information on data from the VRAR in an Appendix - if their basis and validity were described in more detail, then greater reliance and use might be made of them. All of the DAR and VRAR endpoints might then be considered together instead of separately?

The use of geometric means may be accepted if they cover the same effect end points for the same species, tested under similar enough conditions (the dossiers do not provide any rationale for the derivation of geometric means for individual species). The CLP guidance also indicates that at least four endpoints are preferred for each geomean. This may be important for key values such as the short-term *Pimephales promelas* data at pH 5.5-6.5, where only two studies are available. In this case, might it be better to select the lowest value of 0.0044 mg/L for this pH range? Ideally 'sensitive' species in acute tests should

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also be reflected in the chronic data set. As there is no long-term test for *P. promelas* at this pH range, might this require use of the surrogate approach and affect the acute and chronic reference values that have been selected? For long-term toxicity to fish, it also appears that an *Oncorhynchus mykiss* ELS NOEC of 0.0017 mg dissolved Cu/L (from DAR data) is missing from the study on 'Copper Hydroxide WP' - this would be equivalent to (and lower than) the dissolved Cu values apparently from the VRAR.

Given the amount of ecotoxicological data on copper, could more use be made of species sensitivity distributions (SSD) and HC5 values (if presented separately for each trophic group and for short and long-term). It appears that there are more ecotox data on copper than those given here, particularly for invertebrates where only *Daphnia/Ceriodaphnia* are presented in the reports. Data on various other invertebrates are reported in the VRAR but its not clear why these are omitted.

Additional SSDs are presented in the VRAR, are any of these appropriate? Discussion with colleagues working on the Water Framework Directive highlight that they have derived Environmental Quality Standards (EQS) for copper using the whole available data set, including data in the VRAR. These EQS were, in part, determined using SSDs and Biotic Ligand Model (BLM) calculations and a fairly high degree of confidence was expressed in their derivation. Since there are analogies with at least the chronic classification endpoint for copper, we wonder whether use could also be made of this EQS work? The use of SSDs and HC5s for copper would set new precedents for hazard classification however, so it might be questioned whether we should always default to the lowest value when we have such a data-rich substances.

One HC5 is mentioned in the CLH Reports for sediment dwellers. Given the suggested removal to and persistence in sediment, there is relatively little discussion of the exposure and hazard to sediment dwellers - even though it is said that uncertainty here is high. The SSD behind this HC5 is not presented and there is also little information on the chironomid study from the tribasic copper sulphate DAR (included under algal endpoints at 5.5). Presumably this is based on a water spiking study whereas the VRAR HC5 (in mg/kg) is from sediment spiked studies? With further information from the studies, might it be possible to recalculate the endpoints according to sediment pore water concentrations? How the aquatic hazard classification should be determined in the presence of sediment is still unclear however.

Further reference to the studies reported in the copper DARs for algae may allow presentation of their NOEC values for inclusion in the long-term hazard assessment.

The final 2013 EFSA Conclusion on pesticidal use of copper compounds reports a microcosm 'NOEC' of 0.0048 mg dissolved Cu/L (rather than 0.00312 mg/L at 5.4.4 and 5.5), although it is unclear how this would be used for hazard classification.

In the table at Section 5.5 a 21-day endpoint for *O. mykiss* is reported, but it is not clear how relevant this is for comparison with the classification criteria.

Ideally it would help to have briefly explained the Ecotoxicity Reference Value (ERV) concept, as it is not initially clear why endpoints expressed as either the substance in question, or total Cu, or ionic Cu²⁺ (whichever is considered the most appropriate form) cannot be used at face value. We haven't checked all of the ERV calculations, however, whilst the chronic ERVs from the VRAR can be back-calculated to identifiable endpoints, we could not find the endpoint used to derive the acute VRAR ERV at pH 5.5-6.5 of 0.045 mg/L. Overall, the selection of appropriate short and long-term endpoints for each trophic group

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and the workings for these ERV calculations, could be presented more clearly for each substance.

Overall, and depending on the response to our comments, we do not currently agree that the substances can be considered rapidly removed, therefore we feel that all of the substances should be classified H400/410 with relevant M factors.

Dossier Submitter's Response

In the current published version of the CLP guidance (Guidance on the Application of the CLP Criteria Version 4.0 – November 2013) the parts concerning "rapid removal from water column" have indeed been deleted. Moreover, as no consensus was found during the ECHA workshop on the concept of rapid removal on February 8th, 2012, and taking into account comments from several MS (Finland, Germany, Denmark, UK) this concept might be not considered in the current assessment. The long-term classification and M factors would therefore need to be updated accordingly (see final proposal for Chronic classification and M factor at the end of this document).

For bioaccumulation, the question would need further clarification before answering.

All endpoints are expressed in all available forms in the tables for better transparency. For the VRA, as mentioned in the introduction of section 5.4, all endpoints are expressed in dissolved copper.

Concerning VRAR endpoints, a link to the appendix related to classification could be added in the document. For the question on whether or not data from the DAR and VRAR should be considered together, we considered that they shouldn't as data from the VRAR are not specific for Dicopper oxide; copper (I) oxide, when data from the DAR are.

Considering the use of geo mean values, we agree, however in this case there is no impact on classification.

For long term data on fish issued from the DAR, data on specific salts were related to each compound.

Concerning SSD, it is our knowledge that HC5 are not used for classification purposes. Concerning the remark on microcosm study, it is our understanding that these values are neither used for classification purposes.

In the table at Section 5.5 a 21-day endpoint for *O. mykiss* is reported for information.

For ERV calculations, all endpoints used were expressed in dissolved copper before transformation.

RAC's response

Date	Country	Organisation	Type of Organisation	Comment number
30.01.2014	Denmark		MemberState	10
Comment received				
We do not agree that copper flakes can be regarded as rapidly "degrading", and therefore the M-factor to be applied in the chronic classification should be 10 and not 1 as suggested in the dossier				

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ECHA note: The information below was provided in Rapid-degradation-copper flakes.doc [attachment 5]

Danish comments on the environmental classification of copper flakes (coated with aliphatic acid)

We do not agree that copper flakes can be regarded as rapidly “degrading”, and therefore the M-factor to be applied in the chronic classification should be 10 and not 1 as suggested in the dossier.

In the section on classification for environmental hazards the concept of “rapid removal” has been applied as an analogy to rapid degradation.

However, the “rapid removal” concept is not generally accepted as an applicable tool in classification of metals in neither the CLP nor in the GHS.

Thus in the CLP guidance the paragraphs on “rapid removal” that were introduced in a draft were removed because of “lack of scientific consensus” (Guidance on the Application of the CLP Criteria, Version 4.0, November 2013, Appendix IV, IV.3).

Likewise, EUROMETEAUX and ICMM proposed to introduce the concept of “rapid removal” in the GHS guidance document, Annex A9.7, but the GHS correspondence group in December 2013 decided to leave it out for the same reasons as above in the CLP guidance.

The “rapid removal” concept is risk based, and not adequate for hazard classification purposes.

The outlined procedures and models in the “rapid removal” concept assume completely still-standing water, a situation you will hardly find anywhere in natural waters; certainly that would be rather special localities, and the concept is absolutely inapplicable to running waters. Thus, the suggested procedure not only represents risk assessment, it is not even generic risk assessment, but very, very local risk assessment.

Binding to particles in the water column with a following sedimentation and binding in the sediment has not been accepted for organic substances. The reason for this is that such processes will depend highly on local conditions. Also, the rate of such processes will vary with the depth of the water column, and this was the main argument for not taking volatility into account in the hazard assessment. For the same reasons these processes cannot be applied in the hazard assessment and classification of metals.

The Ticket-Unit-World model has been developed for lakes, so far without currents and turbulence. And the model will not be applicable to running waters. The model also employs binding to organic particles and precipitation of these to the sediment, which, as said above, cannot be accepted in the framework of hazard assessment and classification.

The binding in the sediment (e.g. to sulphides) is not really an irreversible process. It requires undisturbed sediment that doesn't get oxygenized, while in natural waters you will normally see a number of processes that can stir the sediment at different times, such as e.g. storms and burrowing animals. And again, it won't apply to running waters.

Thus the “rapid removal” concept is purely a risk assessment tool and not applicable to hazard identification and classification, and has not been accepted for hazard identification under the CLP and GHS.

Further, it is in the dossier suggested that 70% removal of the soluble form of a metal would be analogous to 70% degradation (mineralization) of an organic substance.

However, recall that the 70 % (or 60% depending on test-method) mineralization of organic substances really represents close to 100% degradation, as a substantial part of the last 30 % is built into microbial biomass. A 70% removal of a metal is therefore not at all equivalent with the 70 % mineralization of organics.

Also, looking at the transformation/dissolution protocol results for CuO given in the voluntary risk assessment (VRAR) Appendix K1, it is evident that there is a marked *increase* in soluble Cu from day 7 to day 28 (about a factor of 4). If there was a rapid transformation of soluble forms to insoluble forms this would be seen as a marked *decrease* of soluble forms in the T/D protocol tests. The table below is from VRAR:

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Table 8: Summary of the transformation/dissolution data obtained for CuO, at different loadings and different pHs.

CuO loading rate (mg/l)	Time (days)	Measured Cu concentration (µg/l)		
		pH6	pH7	pH8
1	7	49	5	0
10	7	221	22	3
100	7	980	64	10
1	28	210	9	1

The implication of this is that the substance cannot be regarded as rapidly “degrading”, and therefore the M-factor for Chronic 1 is 10.

Danish Environmental Protection Agency,

Strandgade 29, DK-1401 Copenhagen K, Denmark

Dossier Submitter’s Response

In the current published version of the CLP guidance (Guidance on the Application of the CLP Criteria Version 4.0 – November 2013) the parts concerning “rapid removal from water column” have indeed been deleted. Moreover, as no consensus was found during the ECHA workshop on the concept of rapid removal on February 8th, 2012, and taking into account comments from several MS (Finland, Germany, Denmark, UK) this concept might be not considered in the current assessment. The long-term classification and M factors would therefore need to be updated accordingly (see final proposal for Chronic classification and M factor at the end of this document).

RAC’s response

Date	Country	Organisation	Type of Organisation	Comment number
03.02.2014	Germany		MemberState	11

Comment received

The DE CA has general problems with some methodologies referring to the environmental classification used in the CLH-proposal:

i) Methodology for chronic classification

Regarding the chronic environmental classification and labeling, the proposal is based on the concept of “rapid removal” for assessment of environmental transformation. However, the interpretation of this concept is not yet finally agreed upon (cf. comment by the ECHA on page 503 of the Guidance Document for the application of CLP criteria).

In the view of the German Federal Environment Agency the concept of “rapid degradation” as foreseen by the CLP Regulation for organic substances cannot be compared to the risk based concept of “rapid removal/transformation” of inorganic substances (metals are not degraded but simply relocated from the water column to e.g. the sediment). Hence, the concept of “rapid removal” seems not adequate for the hazard based classification according to CLP. For this reason we cannot support the chronic classification proposed by FR.

As long as the concept of “rapid removal” for inorganic compounds is not finally agreed upon, the aquatic chronic classification should be based on the criteria for not rapidly degradable substances as it was done for all substances including metals before.

ii) Use of geometric mean for classification and labeling

According to the CLP Regulation (section 4.1.2.3) “the lowest of the available toxicity values shall normally be used to define the appropriate hazard category(ies).” In the Guidance

ANNEX 2 - COMMENTS AND RESPONSE TO COMMENTS ON CLH PROPOSAL ON COPPER FLAKES (COATED WITH ALIPHATIC ACID)

Document on the application of the CLP criteria the following is stated: "Where more than one acceptable test is available for the same taxonomic group, the most sensitive (the one with the lowest L(E)C50 or NOEC/EC10) is generally used for classification. [...] When larger data sets (four or more values) are available for the same species, the geometric mean of toxicity values may be used as the representative toxicity value for that species."

Accordingly, the geometric mean may be used for the derivation of the lowest acute and chronic endpoint for data rich substances, if four or more endpoints are available for one species. Please note that this is not always the case for the data used for classification in the CLH reports. We therefore suggest using the lowest effects value as it was proposed and agreed for example within the Competent Authority Assessment Reports (e.g. DAR for pesticides, CAR for biocides).

iii) Data basis for classification

Most of the data available on copper compounds has been submitted under the EU Voluntary risk assessment (VRA) under the Existing Substances Regulation. The adequacy of the data presented in the VRA is questionable with regard to classification and labeling as it has not been discussed by any technical group competent for classification as stated by FR in the CLH Report. Therefore we suggest taking into account the data which has recently been fully evaluated by competent authorities and which has been taken for a classification and labeling proposal (e.g. DAR for pesticides, CAR for biocides, see specific comments on environmental classification).

For these three indicated points, we propose to revise the CLH-Dossier accordingly.

Further points:

p. 174: Please clarify whether the given toxicity data refer to the copper ion only or a copper compound.

p. 176: Please clarify why the T/D test at pH 6 is the worst case scenario (pH 4 water solubility (192 mg/l), see p. 12)

p. 176: For the transformation of the substance the test results of the deposition and remobilisation should be stated as that was one of the aims conducting the test.

Biocide Regulation: Please note that the lowest NOEC reported under the BPD for copper (e.g. in the Assessment Report for the biocidal active substance copper (ii) hydroxide / Product type 8, RMS France, September 2011) is 2.2 µg Cu/L (growth of *Oncorhynchus mykiss*). This value is given in the CLH Report in the table on p. 173, section 5.4.1.2 for the test organism *O. mykiss* in the column "all pHs". However, this endpoint has not been considered for the environmental classification in the CLH report (cf. Conclusion of environmental classification according to Regulation EC 1272/2008 on page 176). Please take this endpoint for the aquatic chronic classification of copper flakes into account.

Dossier Submitter's Response

- i) In the current published version of the CLP guidance (Guidance on the Application of the CLP Criteria Version 4.0 – November 2013) the parts concerning "rapid removal from water column" have indeed been deleted. Moreover, as no consensus was found during the ECHA workshop on the concept of rapid removal on February 8th, 2012, and taking into account comments from several MS (Finland, Germany, Denmark, UK) this concept might be not considered in the current assessment. The long-term classification and M factors would therefore need to be updated accordingly (see final proposal for Chronic classification and M factor at the end of this document).
- ii) We agree, however in this case there is no impact on classification.
- iii) The biocide CAR is based on data submitted in the RAR. All data available in the

ANNEX 2 - COMMENTS AND RESPONSE TO COMMENTS ON CLH PROPOSAL ON COPPER FLAKES (COATED WITH ALIPHATIC ACID)

pesticide DAR are also included in this dossier.
RAC's response
Dossier Submitter's New Chronic Classification proposal without rapid removal concept
chronic 1
M = 10

ATTACHMENTS RECEIVED:

- 1. EMPA comments to the CLH report: proposal for harmonized classification and labelling of copper flakes (coated with aliphatic acid)** (file name: EMPA_Comments_to_the_CLH_report) submitted by European Metal Particulates Association - a division of the German Aluminium Association on 3 February 2014 [The content was copied to comments no. 5, 8]
- 2. ECI comments to CLH report: proposal for harmonized classification and labelling of copper flakes (coated with aliphatic acid)** (file name: Comments to the CLH dossier copper flakes ECI Jan 2014.doc) submitted by Regulatory Compliance Limited on 3 February 2014 [The content was copied to comments no. 4, 7]
- 3. ECI attachment (2) for information - classification versus solubility for copper compounds and copper flake** (file name: Classification versus pH and solubility.doc) submitted by Regulatory Compliance Limited on 3 February 2014 [The content was copied to comment no. 7]
- 4. Acute & chronic ecotoxicity of soluble copper species in view of hazard classification of copper and copper compounds** (file name: Van Sprang and Delbeke 2010) submitted by Regulatory Compliance Limited on 3 February 2014 [please refer to comments no. 4,7]
- 5. Danish comments on the environmental classification of copper flakes (coated with aliphatic acid)** (file name: Rapid-degradation-copper flakes.doc) submitted by Denmark on 30 January 2014 [The content was copied to comment no.10]
- 6. Acute Toxicity: Acute Inhalation Toxicity in the Rat** (filename: Copper Flake Acute inhalation study_February 2014_summary.docx) submitted by Regulatory Compliance Limited on 3 February 2014 [please refer to comment no. 4]
- 7. Solubility in water – Transformation, dissolution in aqueous media** (filename: Copper Flake transformation_dissolution study_February 2014_summary.docx) submitted by Regulatory Compliance Limited on 3 February 2014 [please refer to comment no. 7]

CONFIDENTIAL STUDIES:

- 1. Leuschner, 2011**
- 2. Schaefers and Klawonn, 2013**