COMMENTS AND RESPONSE TO COMMENTS ON OEL: PROPOSAL AND JUSTIFICATION

All comments and attachments including confidential information received during the consultation have been provided in full to the Committees and to the European Commission. Non-confidential attachments that have not been copied into the table directly are published after the consultation and are also published together with the opinion (after adoption) on ECHA's website. Although journal articles are not confidential, they are not published on the website due to Intellectual Property Rights.

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Last data extracted on 13.06.2022

Substance name: Cobalt and inorganic cobalt compounds
EC number: -
CAS number: -

GENERAL COMMENTS

Date	Country	Organisation	Type of Organisation	Comment number
09.06.2022	Luxembourg	CERATIZIT S.A.	Company Manufacturer	1
Comment received				
p.22 Essential use of Co as binder metal in the hard metal production should be considered. p.39+p.116/117 Different bioaccessibility data should be considered when defining OELs for various cobalt compounds. p.115 A conversion factor for respirable to inhalable fraction was determined to be 10.3 +- 0.1 out of 161 person-based measurements in past 3 years and should be taken into account. For more detail see attached document. ECHA note – An attachment was submitted with the comment above. Refer to public attachment 20220607_CERATIZIT_Response ECHA.pdf				
ECHA/RAC Response				
As regards the use of cobalt in hard metal production, the section 5.2.3 was expanded to include the industrial sectors which are using various hard-metal tools. RAC noted that the available scientific knowledge does not allow to extrapolate higher thresholds based on distinct bioavailabilities, e.g. as measured in artificial lung fluids. RAC considered that the identification of a distinct threshold for poorly soluble cobalt compounds substances is not possible due to insufficient data. RAC derived an-8 h OEL for the respirable fraction based on animal inhalation study data and an 8-h OEL for the inhalable fraction from human data. Therefore there was no need for conversion factors for extrapolation between the fractions. As regards the epidemiological study by Marsh et al. (2017) referred by CERATIZIT S.A. and already described in the scientific report that was subject to consultation, additional arguments have been included in the Annex 1 of the opinion.				

Date	Country	Organisation	Type of Organisation	Comment number

08.06.2022	Germany		Individual	2
Comment received				
Company Horn Hartstoffe GmbH fully supports the scientific position of the Cobalt Institute (CI) contained within 'CI Response ECHA PC Co OEL' and submitted into this Public Consultation for the development of occupational exposure limit values. We highlight that the ECHA proposal for a non-threshold approach with breakpoint could be premature given the testing proposals that were submitted and existing epidemiological data supportive of a threshold in the dose-response for carcinogenicity."				
ECHA/RAC Response				
The assessment is based on currently available data, and data potentially being generated later cannot be considered for the purpose of this report. A comparison of epidemiological data with the animal data derived ERR is added and presented in Appendix 7 of Annex 1.				

Date	Country	Organisation	Type of Organisation	Comment number
08.06.2022	Sweden	Teknikföretagen	Industry or Trade Association	3
Comment received				
Teknikföretagen (the Association of Swedish Engineering Industries) is the primary representative for Swedish industry. In total, our 4 300 member companies constitute one third of Sweden's exports. Our member companies supply the solutions with which to tackle the greatest challenges of our times. Teknikföretagen fully supports the scientific position of the Cobalt Institute (CI) contained within 'CI Response ECHA PC Co OEL' and submitted into this public consultation for the development of occupational exposure limit values. Teknikföretagen highlights that the ECHA proposal for a non-threshold approach with breakpoint could be premature given the testing proposals that were submitted and existing epidemiological data supportive of a threshold in the dose-response for carcinogenicity.				
ECHA/RAC Response				
The assessment is based on currently available data, and data potentially being generated later cannot be considered for the purpose of this report. A comparison of epidemiological data with the animal data derived ERR is added and presented in Appendix 7 of Annex 1.				

Date	Country	Organisation	Type of Organisation	Comment number
07.06.2022	Germany	<confidential>	Company Manufacturer	4
Comment received				
Company Element Six GmbH fully supports the scientific position of the Cobalt Institute (CI) contained within 'CI Response ECHA PC Co OEL' and submitted into this Public Consultation for the development of occupational exposure limit values. We highlight that the ECHA proposal for a non-threshold approach with breakpoint could be premature given the testing proposals that were submitted and existing epidemiological data supportive of a threshold in the dose-response for carcinogenicity.				
ECHA/RAC Response				
The assessment is based on currently available data, and data potentially being generated later cannot be considered for the purpose of this report. A comparison of epidemiological data with the animal data derived ERR is added and presented in Appendix 7 of Annex 1.				

Date	Country	Organisation	Type of Organisation	Comment number
07.06.2022	Germany	TRIBO Hatstoff GmbH	Company Manufacturer	5
Comment received				
Company TRIBO Hartstoff GmbH fully supports the scientific position of the Cobalt Institute (CI) contained within 'CI Response ECHA PC Co OEL' and submitted into this Public Consultation for the development of occupational exposure limit values. We highlight that the ECHA proposal for a non-threshold approach with breakpoint could be premature given the testing proposals that were submitted and existing epidemiological data supportive of a threshold in the dose-response for carcinogenicity.				
ECHA/RAC Response				
The assessment is based on currently available data, and data potentially being generated later cannot be considered for the purpose of this report. A comparison of epidemiological data with the animal data derived ERR is added and presented in Appendix 7 of Annex 1.				

Date	Country	Organisation	Type of Organisation	Comment number
07.06.2022	Germany	Fachverband Pulvermetallurgie e.V. FPM	Industry or Trade Association	6
Comment received				
FPM fully supports the scientific position of the Cobalt Institute (CI) contained within 'CI Response ECHA PC Co OEL' and submitted into this Public Consultation for the development of occupational exposure limit values. We highlight that the ECHA proposal for a non-threshold approach with breakpoint could be premature given the testing proposals that were submitted and existing epidemiological data supportive of a threshold in the dose-response for carcinogenicity. We ask ECHA for approving the proposed tests by the Cobalt Institute instead of pretending a lack of evident data. ECHA note – An attachment was submitted with the comment above. Refer to public attachment CI Response ECHA PC Co OEL - Exeuctive Summary 2022June05.pdf				
ECHA/RAC Response				
The assessment is based on currently available data, and data potentially being generated later cannot be considered for the purpose of this report. A comparison of epidemiological data with the animal data derived ERR is added and presented in Appendix 7 of Annex 1. The evaluation of testing proposals is a process under REACH and is not directly connected to the evaluation of the scientific relevance of occupational exposure limits (OELs) for cobalt and inorganic cobalt compounds, which is related to the Directive 2004/37/EC on the protection of workers from the risks related to exposure to carcinogens mutagens or reprotoxic substances at work (CMRD).				

Date	Country	Organisation	Type of Organisation	Comment number
07.06.2022	Germany	TIGRA GmbH	Company-Downstream User	7
Comment received				
TIGRA GmbH fully supports the scientific position of the Cobalt Institute (CI) contained within 'CI Response ECHA PC Co OEL' and submitted into this Public Consultation for the development of occupational exposure limit values. We highlight that the ECHA proposal				

for a non-threshold approach with breakpoint could be premature given the testing proposals that were submitted and existing epidemiological data supportive of a threshold in the dose-response for carcinogenicity
ECHA/RAC Response
The assessment is based on currently available data, and data potentially being generated later cannot be considered for the purpose of this report. A comparison of epidemiological data with the animal data derived ERR is added and presented in Appendix 7 of Annex 1.

Date	Country	Organisation	Type of Organisation	Comment number
10.06.2022	Belgium	FEFAC	Industry or Trade Association	8
Comment received				
FEFAC represents the EU compound feed industry. The supplementation of feed for ruminants with cobalt compounds is essential to prevent animal health and welfare issues linked to potential cobalt deficiencies. FEFAC would like herewith to provide its support to the position expressed by the Cobalt Institute contained in the document "CI response to the ECHA Public Consultation on the Co OELV" submitted as part of the present consultation, i.e. that the establishment of a non-threshold approach with breakpoint may be premature and that ECHA and RAC should use a weight-of-evidence approach to assess cobalt and reactive cobalt compounds, taking into account toxicity, epidemiological and mode-of-action data, using high-quality scientific methodology to set practical OELVs.				
ECHA/RAC Response				
All available data is considered in the assessment and development of the RAC opinion.				

Date	Country	Organisation	Type of Organisation	Comment number
10.06.2022	Germany	VDMA Precision Tools	Industry or Trade Association	9
Comment received				
page 10, 11 ECHA evaluation and recommendation ECHA note – An attachment was submitted with the comment above. Refer to public attachment 2022-06-10_VDMA-Position_ECHA.pdf				
ECHA/RAC Response				
As regards the use of cobalt in hard metal production, the section 5.2.3 was expanded to include the industrial sectors which are using various hard-metal tools. RAC noted that the available scientific knowledge does not allow to extrapolate higher thresholds based on distinct bioavailabilities, e.g. as measured in artificial lung fluids. RAC considered that the identification of a distinct threshold for poorly soluble cobalt compounds substances is not possible due to insufficient data. RAC derived an 8-h OEL for the respirable fraction based on animal inhalation study data and an 8-h OEL for the inhalable fraction from human data. Therefore there was no need for conversion factors for extrapolation between the fractions. As regards the epidemiological study by Marsh et al. (2017) referred by VDMA and already described in the scientific report that was subject to consultation, additional arguments have been included in the Annex 1 of the opinion.				

Date	Country	Organisation	Type of Organisation	Comment number
10.06.2022	Belgium	Catalysts Europe - sector group of Cefic	Industry or Trade Association	10
Comment received				
Catalysts Europe fully supports the scientific position of the Cobalt Institute (CI) contained within the document 'CI Response to the ECHA PC on the Co OELV' and submitted into this Public Consultation for the development of occupational exposure limit values. Catalysts Europe highlights that the ECHA proposal for a non-threshold approach with breakpoint could be premature given the testing proposals that were submitted and existing epidemiological data supportive of a threshold in the dose-response for carcinogenicity.				
ECHA/RAC Response				
The assessment is based on currently available data, and data potentially being generated later cannot be considered for the purpose of this report. A comparison of epidemiological data with the animal data derived ERR is added and presented in Appendix 7 of Annex 1.				

Date	Country	Organisation	Type of Organisation	Comment number
10.06.2022	Germany	WVMetalle	Industry or Trade Association	11
Comment received				
Within the ECHA Scientific report for evaluation of limit values for cobalt and inorganic cobalt compounds at the workplace the AGS (2017) is cited and it represents a substantial basis for the conclusions. It is therefore of high relevance to note that the AGS is working on an update of the cobalt assessment. This includes a reevaluation of the ERR for the respirable fraction as well as a dedicated assessment of the epidemiological data with respect to an OEL for the inhalable fraction. The AGS has not yet officially endorsed this update but it is foreseen to happen soon. It is therefore of utmost importance to take this most recent scientific assessment on limit values for the workplace on cobalt into account within the upcoming RAC debates.				
ECHA/RAC Response				
The recent AGS report has been published now and the reference is included in Annex 1.				

Date	Country	Organisation	Type of Organisation	Comment number
10.06.2022	France	French agency for food, environment and occupational health & safety	National Authority	12
Comment received				
Please see attached documents ECHA note – An attachment was submitted with the comment above. Refer to public attachment Anses comments ECHA OEL cobalt 20220610 .zip				
ECHA/RAC Response				
General comments: RAC considers that the exposure-response relationship earlier derived for local lung effects is still valid. Regarding the systemic carcinogenicity findings in animals exposed to cobalt metal, RAC considered that these effects are most likely not relevant at dose levels not causing lung damage.				

The comment on general population epidemiology data is acknowledged and further explanation on why such data are not directly suitable for quantitative OEL setting was added in order to justify why such data are presented only based on reviews

RAC noted that the available scientific knowledge does not allow to extrapolate different (higher) thresholds based on distinct bioavailabilities, e.g. as measured in artificial lung fluids.

Comments on external exposure:
Regarding the sampling of inhalable or respirable fraction. Our intention was to make clear what the method as published is covering (e.g. inhalable and /or respirable). Then in the last column it is reflected whether other fraction could be sampled and whether the LOQ could be the same. Now this has been made clearer.

At the time of the consultation, no OEL value was proposed in the draft report. However, as the final Opinion proposes a value the text has been redrafted to flag that some of the methods in the table fulfil the requirements of the EN 482 for the values proposed for both inhalable and respirable fractions.

A sentence stating the possible differences in performance of the methods listed under "similar methods" has been included.

The list of methods intends to show how feasible it is to measure low concentration of cobalt in air. For that reason the maximum flow rate of commertially available respirable samplers is often used to calculate the LOQ (10 l/min). It is not the objective of this section to advise on how to actually do the sampling, but agreed that for sampling times closer to 8 hours the LOQ will be even lower. A sentence stating the lowest concentrations that could be measured following such methods has been included and references are provided.

Please note that the list of methods does not intend to be exhaustive, but to show whether there are methods available to show compliance with a proposed OEL (Or potential for it). Some additional methods have in any case been added (see also reply to comment number 23).

Comments on genotoxicity
Your detailed comments have been considered; missing data from studies (e.g. Burzloff et al, 2022) or conclusions (e.g. the oxidative stress being a poor inducer of the DNA damage response; Hendricks et al, 2016) have now been added to the relevant Tables/sections. Conclusions such as that the K-ras mutations in the investigated neoplasms of the chronic bioassays are reflective of secondarty genotoxic events associated with inflammatory and oxidative stress, have now been further emphasised in the text.

Editorial/detailed comments
Your detailed comments have been considered and several changes have been implemented or details specified in the Opinion and/or Annex.

Date	Country	Organisation	Type of Organisation	Comment number
10.06.2022	Germany	Konrad Friedrichs GmbH & Co. KG	Company-Downstream User	13

Comment received
Company Konrad Friedrichs GmbH & Co. KG, Vorwerkstraße 20, 95326 Kulmbach as a subsidiary of the Guehring group, Herderstraße 50-54, 72458 Albstadt, fully supports the scientific position of the Cobalt Institute (CI) contained within 'CI Response ECHA PC Co OEL' and submitted into this Public Consultation for the development of occupational exposure limit values. We highlight that the ECHA proposal for a non-threshold approach with breakpoint could be premature given the testing proposals that were submitted and existing epidemiological data supportive of a threshold in the dose-response for carcinogenicity." ECHA note – An attachment was submitted with the comment above. Refer to public attachment CI Response ECHA PC Co OEL - Exeuctive Summary 2022June05.pdf
ECHA/RAC Response
The assessment is based on currently available data, and data potentially being generated later cannot be considered for the purpose of this report. A comparison of epidemiological data with the animal data derived ERR is added and presented in Appendix 7 of Annex 1.

Date	Country	Organisation	Type of Organisation	Comment number
10.06.2022	Germany	Gühring KG	Company-Downstream User	14
Comment received				
Company Guehring KG, Herderstraße 50-54, 72458 Albstadt, fully supports the scientific position of the Cobalt Institute (CI) contained within 'CI Response ECHA PC Co OEL' and submitted into this Public Consultation for the development of occupational exposure limit values. We highlight that the ECHA proposal for a non-threshold approach with breakpoint could be premature given the testing proposals that were submitted and existing epidemiological data supportive of a threshold in the dose-response for carcinogenicity." ECHA note – An attachment was submitted with the comment above. Refer to public attachment CI Response ECHA PC Co OEL - Exeuctive Summary 2022June05.pdf				
ECHA/RAC Response				
The assessment is based on currently available data, and data potentially being generated later cannot be considered for the purpose of this report. A comparison of epidemiological data with the animal data derived ERR is added and presented in Appendix 7 of Annex 1.				

Date	Country	Organisation	Type of Organisation	Comment number
10.06.2022	Germany	Albemarle	Company Importer	15
Comment received				
Albemarle fully supports the scientific position of the Cobalt Institute (CI) contained within the document 'CI Response to the ECHA PC on the Co OELV' and submitted into this PC for the development of occupational exposure limit values. We highlight that the ECHA proposal for a non-threshold approach with breakpoint could be premature given the testing proposals that were submitted and existing epidemiological data supportive of a threshold in the dose-response for carcinogenicity.				
ECHA/RAC Response				
The assessment is based on currently available data, and data potentially being generated later cannot be considered for the purpose of this report. A comparison of epidemiological data with the animal data derived ERR is added and presented in Appendix 7 of Annex 1.				

Date	Country	Organisation	Type of Organisation	Comment number
10.06.2022	Germany	G-Elit Präzisionswerkzeug GmbH	Company-Downstream User	16

Comment received

Company G-Elit Präzisionswerkzeug GmbH, Lübarser Straße 10 – 38, 13435 Berlin as a subsidiary of the Guehring group, Herderstraße 50-54, 72458 Albstadt, fully supports the scientific position of the Cobalt Institute (CI) contained within 'CI Response ECHA PC Co OEL' and submitted into this Public Consultation for the development of occupational exposure limit values. We highlight that the ECHA proposal for a non-threshold approach with breakpoint could be premature given the testing proposals that were submitted and existing epidemiological data supportive of a threshold in the dose-response for carcinogenicity."

ECHA note – An attachment was submitted with the comment above. Refer to public attachment ECHA-Stellungnahme_10_06_2022.docx

ECHA/RAC Response

The assessment is based on currently available data, and data potentially being generated later cannot be considered for the purpose of this report. A comparison of epidemiological data with the animal data derived ERR is added and presented in Appendix 7 of Annex 1.

Date	Country	Organisation	Type of Organisation	Comment number
10.06.2022	Switzerland	Extramet AG	Company-Downstream User	17

Comment received

Extramet AG is committed to safety along with robust evaluation and therefore supports the scientific position of the Cobalt Institute (CI) contained within 'CI Response ECHA PC Co OEL' and submitted into this Public Consultation for the development of occupational exposure limit values. We highlight that the ECHA proposal for a non-threshold approach with breakpoint could be premature given the testing proposals that were submitted and existing epidemiological data supportive of a threshold in the dose-response for carcinogenicity

ECHA/RAC Response

The assessment is based on currently available data, and data potentially being generated later cannot be considered for the purpose of this report. A comparison of epidemiological data with the animal data derived ERR is added and presented in Appendix 7 of Annex 1.

Date	Country	Organisation	Type of Organisation	Comment number
10.06.2022	France	MICHELIN	Company Manufacturer	18

Comment received

See confidential information

ECHA note – An attachment was submitted with the comment above. Refer to confidential attachment Reply to the public consultation regarding the occupational exposure limits for cobalt and cobalt compounds MICHELIN.pdf

ECHA/RAC Response

On MoA, although RAC agrees that there is data to support the plausibility of ROS, hypoxia and inflammation -based MoA, the available data is not conclusive to exclude the possible role of also other (threshold or non-threshold) mechanisms in the carcinogenicity

of cobalt, including mutagenicity, epigenetic changes, alterations in DNA repair and immunosuppression.

RAC derived an 8-h OEL for the respirable fraction based on animal inhalation study data and an 8-h OEL for the inhalable fraction from human data. Therefore there was no need for conversion factors for extrapolation between the fractions.

It is noted that the meta-analysis on cancer risk in the rubber industry is not reporting results by exposure level to any cobalt compound that may have been used in such activities.

The RAC opinion contains a discussion on the use of the OEL for poorly soluble cobalt substances or cobalt substances with no relevant substance-specific study data available.

Your support to apply biomonitoring is noted.

Date	Country	Organisation	Type of Organisation	Comment number
10.06.2022	Germany	Federal Institute of Occupational Safety and Health	National Authority	19

Comment received

Division 4 - Hazardous Substances and Biological Agents of the Federal Institute of Occupational Safety and Health prepared the following comment on the draft of the OEL-report for cobalt and inorganic cobalt compounds at the workplace.

General comments:
Different to the previous RAC proposal there is no OEL for the inhalable fraction proposed. This should be more clearly and extensively explained in the respective paragraphs, especially in the summarizing overview paragraphs.

Cobalt in urine is considered a suitable biomarker of the internal exposure to cobalt. The correlation between external air exposure at workplace and internal exposure, as measured by excretion in the urine, has been addressed in several studies. In general, a very good linear correlation has been found for different cobalt compounds and cobalt metal between the concentration of cobalt in urine and the concentration of cobalt in inhaled air. The most of the cobalt compounds tested are soluble compounds.
The same correlation to inhaled insoluble cobalt compounds (such as Co3O4), which are retained in the lungs and have a longer excretion time, only applies if the following conditions are satisfied (see "Begründung zu Cobalt" in TRGS 900):

i. the excretion is measured after a sufficient long time after exposure, and

ii. during this time, the air concentration of the cobalt compounds remains relatively con-stant.

Studies on the excretion of cobalt oxide in humans showed that around 60% of the inhaled cobalt oxide is excreted within 6 months after exposure and that the excretion rate depends on the time after exposure and the particle size (ATSDR, 2004). The delay in the urine elimination of insoluble cobalt compounds after exposure via inhalation is a critical point to be considered for the biomoni-toring of cobalt exposure.

A further critical point in the proposal of the 95th percentile value for cobalt in urine in

the general European population as biological guidance value (BGV) can be evidenced by considering an expo-sure to 0.5 µg Co/m3 and calculating the cobalt urine excretion. Studies considering workers exposed to cobalt compounds via inhalation found a linear correlation between air concentration of cobalt and cobalt urine excretion. According to table 15 of the report (EKA correlations derived by DFG) an exposure to 5 µg/m3 cobalt results to a cobalt concentration in urine of 3 µg/L. Considering an exposure to 0.5 µg/m3 cobalt, which corresponds to the breakpoint for lung inflammation, the cobalt excretion in urine would be 0.3 µg/L, which is well below the pro-posed BGV value: for an exposure exceeding the 0.5 µg/m3 value, the lung-inflammation related mechanisms contribute to cancer development, without increasing the urine cobalt excretion over the BGV. Thus, the BGV cannot be considered predictive (and protective) of lung inflammation and lung cancer.

For this reason, the definition of a binding occupational exposure limit value (BOEL) for cobalt and its compounds is suggested as an additional parameter for the protection of workers exposed to cobalt compounds. The RAC proposal of using the breakpoint value for lung inflammation (0.5 µg/m3) as BOEL is thus supported (ECHA 2020: RAC SEAC Opinion on an Annex XV dossier proposing restrictions on: cobalt sulphate, cobalt dichloride, cobalt dinitrate, cobalt carbonate and cobalt di(acetate)).

In paragraph 7.1.3, in vitro data on the metal release from cobalt compounds are presented. The fraction of ions released in artificial simulated fluids is indicated as "bioaccessibility", (metal) "re-lease" and "solubility". The use of the terms "bioaccessibility" and "solubility" in this context is not supported for the following reasons:
i. The term "bioaccessibility" leads to the wrong assumption that particles as such are not accessible and that only metal ions released in simulated fluids contribute to bioavaila-bility. On the contrary, as already discussed above, in particular in case of inhaled insol-uble cobalt compounds, particles retained in the lungs contribute to local effects in the lung and (with delay) to bioavailability;

ii. The term "solubility" refers to the "saturation mass concentration of a substance in a solvent at a given temperature" (OECD 105). The saturation is an equilibrium state be-tween undissolved and dissolved compound and the solubility is estimated from the concentration measured in solution, when such equilibrium is established.

The in vitro studies reported do not assess the solubility, neither give information on the metal that is available for the systemic bioavailability. On the contrary, they are a measure of the metal ions released in simulated fluids under fixed conditions. The use of the term "metal release" is thus highly recommended.

The interpretation and use of the studies presented is another important point of discussion. In particular, the grouping of cobalt salts according to the metal release in simulated fluids after 2 or 5-hours extraction (Verougstraete et al. 2022) is of limited value for the estimation of potential bioa-vailability after inhalation for the following reasons:

i. No correlation has been demonstrated between in vitro metal release and in vivo bioa-vailability of cobalt compounds,

ii. In vitro testing conditions do not account for in vivo conditions,

iii. The metal release after 2 or 5 h extraction times cannot be considered representative of the metal release from insoluble cobalt compounds retained for months in the lungs.

Moreover, the metal release can strongly increase with time, as showed for CoOOH by the authors themselves;

iv. The role of important parameters in the metal release (such as particle sizes) have not been assessed, thus limiting a extrapolation and generalisation of the results to parti-cles of different sizes,

v. The bioavailability of particles as such is not considered.

The paragraph 8.1.3 "recent additional data" on "mode of action considerations" reports a tiered approach for the assessment of cobalt inhalation toxicity of which validity has not been demon-strated by experimental results and which is based on the following wrong assumptions:

i. The metal release is an estimation of potential bioavailability (thus ignoring the bioavail-ability of particles);

ii. The cobalt toxicity can be predicted by measuring the release of cobalt ions in simulated fluids (thus ignoring particle specific effects and the differences between in vitro test-ing and in vivo situation),

iii. Negative results from acute and short-term exposures tests are considered valid also for chronic exposure.

Moreover, the tiered testing strategy uses in vitro cellular assays which are not validated and the authors do not present relevant in vivo data to support their approach. For this reasons, a deletion of the paragraph 8.1.3 is suggested.

Minor comments:

- Angerer et al. 1991 (Ökologisch bedingte Chlorphenolausscheidung— Bevölkerungsstudie. Verhandlungen der Deutschen Gesellschaft für Arbeitsmedizin) does not report any corre-lation between cobalt in the air and cobalt in urine. Please check the reference.

- At page 38 (paragraph 7.1.2.2 Distribution) please change "gastro-intestinal track" in "gas-tro-intestinal tract"

Additional information:
Cobalt is used in additive manufacturing (3D printing) in powder-bed processes. In the respirable particle fraction, exposure to cobalt and its inorganic compounds (carc. 1A and 1B) amounts up to 1.1 µg/m³ (personal air sampling).
(Hebisch, R., Prott, U., Woznica, A., Walter, J., Hustedt, M., Kaierle, S.: Stoffbelastungen bei der additiven Fertigung mit Pulverbettverfahren. Gefahrstoffe – Reinh. Luft 81 (2021), Heft 01-02, 53-59)

ECHA note – An attachment was submitted with the comment above. Refer to public attachment 220610_Comm_FB4_BAuA_OEL_Report_Cobalt.docx

ECHA/RAC Response

Your support for setting a binding OEL is noted. RAC derived an 8-h OEL for the respirable fraction based on animal inhalation study data and an 8-h OEL for the inhalable fraction from human data.

Your information on biomonitoring was considered and a detailed discussion is included in the Opinion.

The term 'metal release' has been introduced as suggested.

Chapter 8.1.3 is still kept in the Annex, but has been slighly revised. In the Opinion RAC noted that the available scientific knowledge does not allow to extrapolate different (higher) thresholds based on distinct bioavailabilities, e.g. as measured in artificial lung fluids.

Editorial changes have been implemented based on your comments.

Date	Country	Organisation	Type of Organisation	Comment number
10.06.2022	Austria	Boehlerit GmbH&Co.KG	Company-Downstream User	20

Comment received

Boehlerit GmbHCo.KG fully supports the scientific position of the Cobalt Institute (CI) contained within 'CI Response ECHA PC Co OEL' and submitted into this Public Consultation for the development of occupational exposure limit values. We highlight that the ECHA proposal for a non-threshold approach with breakpoint could be premature given the testing proposals that were submitted and existing epidemiological data supportive of a threshold in the dose-response for carcinogenicity

ECHA/RAC Response

The assessment is based on currently available data, and data potentially being generated later cannot be considered for the purpose of this report.

Date	Country	Organisation	Type of Organisation	Comment number
10.06.2022	Belgium	ETRMA, European Tyre and Rubber Manufacturers´ Association	Industry or Trade Association	21

Comment received

Introduction

To achieve a satisfactory level of service performance the tyre structure combines rubber compounds and reinforcing cords, which are either textile or metallic depending on the type of tyre and the location in the structure of the tyre. Today most of the tyres in the market are of radial structure. In a radial tyre, carcass ply cords run from bead to bead in a radial manner. The carcass is capped with two or more plies, which makes the crown area very stiff. The use of this technology has been a considerable breakthrough for the tyre industry. Radial tyres combine lightness with better handling, comfort, safety and durability.
Passenger car tyres are generally made of textile cord carcass plies and steel cord crown plies whereas truck and bus tyres, in order to withstand higher pressures and load, requires steel carcass plies only. These steel cords are coated with brass (Cu60%/Zn40%), creating an interphase that is needed to establish a strong bond with the sulphur system of the elastomeric embedding compound during vulcanisation. However, as the interphase between brass and rubber, the reaction zone, is very thin, less than 100 nm, the optimal adhesion between rubber and steel cords requires the use of specific agents that can guarantee this interlocking, in particular for long-term tyre durability.

Cobalt salts used as rubber adhesion promoters are essential for the bonding between steel and rubber. These cobalt salts are being used for more than 40 years, and their use is linked with the development and establishment of radial tyres.
Tyre manufacturers are continuously researching and investigating to optimise their products and processes, but to date, there are no technically feasible alternatives to the use of cobalt salts that would guarantee a comparable or better final product performance in terms of safety and long-term durability.
Cobalt compounds are also used for rubber technical products that require rubber-to-steel adhesion, such as conveyor belts.
Because of this use of Cobalt compounds, the Tyre and Rubber Industry is a significant stakeholder in the regulatory process for the establishment of Occupational Exposure Limits for Cobalt and Cobalt inorganic compounds.
Having carefully assessed the ECHA's Scientific report for evaluation of limit values for cobalt and inorganic cobalt compounds at the workplace we would like to provide the following comments.
The definition of the mode of action of Cobalt is essential to OEL definition approach.

From a general point of view, we would first like to question the mode of action of cobalt and its derivatives as it was considered by ECHA. From our perspective, this is essential from a risk management standpoint for potentially exposed workers.
According to the scientific literature on this subject, in particular both the work carried out and published by the Cobalt Institute (Kirkland 2015, Lison 2018, Danzeisen 2022,) and the NTP report, the carcinogenic mode of action of cobalt comprises several mechanisms induced by the cobalt ions, namely the production of reactive oxygen species and the resulting oxidative stress, the hypoxia-induced by the deregulation of the Hypoxia Inducing Factor 1a (HIF 1a) and the inhibition of the DNA repair mechanisms. These mechanisms are known to be threshold ones. It is therefore not clear why ECHA considers cobalt as a non-threshold carcinogen.
Furthermore, human epidemiological studies in the cobalt industry do not show a correlation between cancer and cobalt exposure (Sauni 2017, Marsh 2017 , IARC), which tends to show that the risk management measures in place, in particular, the existing national OELs allow controlling the is no risk of lung cancer related to exposure to Cobalt.
We understand that for ECHA there is still a lack of toxicological data to definitively demonstrate the existence of a threshold mode of action. We suggest a revision of the position taken by RAC on the mode of action, and, if no conclusion can be taken, indicate what new toxicological study would resolve this scientific controversy.

Cobalt compounds used as rubber adhesion agents

The cobalt compounds registered as rubber adhesion agents are summarized in the table below. (see document attached).

Most of these compounds do not hold a Harmonised Classification. Cobalt carboxylates and resinates do not have carcinogenic effects and are not self-classified as carcinogens. However, some of them show Reprotoxic effects and are self-classified as Repro. 1b.
Risk Management Measures at rubber production sites.
Risk management measures are in place during the tyre and rubber manufacturing in order to control the worker's exposure to substances released during manufacturing, including cobalt salts. The measures have been proven successful in controlling cancer mortality and incidence at rubber manufacturing sites, as demonstrated by the IPRI, the International Prevention Research Institute, that performed over the last years epidemiological studies in cohorts of workers from 1975 in the rubber manufacturing industry. The studies showed no increased risk of cancer mortality and incidence (See M. Boniol et al, 2016; Boniol et al, 2017 and Boniol et al, 2017 b).

ETRMA conducted an occupational exposure campaign in 2018 to collect workers' exposure data at rubber manufacturing sites using cobalt carboxylates. The results were shared by the Cobalt Institute and are included in the ECHA report.
We would like to confirm that the values shown on page 26 and Appendix 3 are accurate for the level of exposure at rubber production sites.

Proposal to address exposure to Cobalt carboxylates and rubber manufacturing sites

ETRMA supports the development of Occupational Limit values at the EU level to control and address the concerns related to the risk of exposure at the workplace. We suggest the following approaches to be considered: an Occupational exposure limit for the Reprotoxic effects of cobalt carboxylates and/or a biological guiding value. Those values would help to address the exposure of cobalt carboxylates that are not carcinogenic.

- Setting two occupational exposure limits, one for cobalt carcinogenic effects and the other for cobalt Reprotoxic effects.
o Two OELs will allow controlling adequately the risk at rubber production sites using reprotoxic carboxylates cobalt compounds that do not show carcinogenic effects and at the same time provide a value to better control the risks related to exposure to compounds with carcinogenic effects.
- Setting a biological limit value for cobalt exposure at the workplace.
o ECHA´s report proposes a Biological Guiding Value of 2 µg cobalt/L urine. We understand the value represents background levels and not biological limit values. At rubber manufacturing sites recommendation of approximately 7 µg/L of creatinine in urine as a biomarker by ANSES is used as a reference value for exposure monitoring
o We support the implementation of BLV at the workplace and invite the RAC to consider the benefits of such as value.

Conclusion

ETRMA supports the setting of EU binding exposure limits at the workplace, including biological limit values. However, almost all carboxylates cobalt compounds used as rubber adhesion agents in the rubber industry are not carcinogenic but most of them are reprotoxic. For those compounds, ETRMA recommends that the potential exposure at rubber manufacturing sites is controlled through the setting of a binding OEL for Reprotoxic effects or a BLV. This approach will help to target adequately the risk for the rubber sector.

ECHA note – An attachment was submitted with the comment above. Refer to public attachment 20220602_ETRMA_Position_OEL_Cobalt_VF.pdf

ECHA/RAC Response

The use of cobalt compounds in the tyre and rubber industry has been modified to include also conveyor belts.

As regards the epidemiological studies of Marsh et al. (2017) and Sauni et al. (2017) referred by ETRMA and already described in the scientific report that was subject to consultation, additional arguments have been included in the Annex 1 of the opinion.

Regarding the epidemiological studies on cancer risk in rubber manufactoring industry (Boniol et al 2016 and 2017), it is noted that they do not report risk estimates by any potential cobalt exposure during such activities or during cobalt compound used in tyre manufacturing.

On MoA, although RAC agrees that there is data to support the plausibility of ROS, hypoxia and inflammation -based MoA, the available data is not conclusive to exclude the possible role of also other (threshold or non-threshold) mechanisms in the carcinogenicity of cobalt, including mutagenicity, epigenetic changes, alterations in DNA repair and immunosuppression. Lack of (long-term) data on poorly soluble cobalt compounds is noted in the Opinion.

RAC did not propose a BLV because the air levels corresponding the proposed OELs are likely to result in urinary levels which are very close to these 95th percentiles of the general population. In addition to the OELs recommended based on local lung effects, RAC also made calculations for a hypothetical limit value based on reproductive effects.

Date	Country	Organisation	Type of Organisation	Comment number
10.06.2022	Germany	BASF SE	Company Manufacturer	22
Comment received				
In July 2021, the European Commission outlined an intention to set EU-wide occupational exposure limit values for cobalt and cobalt compounds. This reflects a desire by both industry and by authorities to harmonize a cobalt OELV as part of better risk management. BASF appreciates the opportunity to submit comments into the public consultation (PC) opened by ECHA on 11th April 2022, regarding the development of occupational exposure limit values for cobalt and inorganic cobalt compounds. BASF fully supports the scientific position of the Cobalt Institute (CI) contained within the document 'CI Response to the ECHA PC on the Co OELV' and submitted into this PC for the development of occupational exposure limit values. We highlight that the ECHA proposal for a non-threshold approach with breakpoint could be premature given the testing proposals that were submitted and existing epidemiological data supportive of a threshold in the dose-response for carcinogenicity.				
ECHA/RAC Response				
The assessment is based on currently available data, and data potentially being generated later cannot be considered for the purpose of this report.				

Date	Country	Organisation	Type of Organisation	Comment number
10.06.2022	Germany	German Social Accident Insurance (DGUV)	National Authority	23
Comment received				
As information to table 8 (Existing Occupational Exposure Limits): The only suggested value (BGV, 2 µg cobalt/L urine) is not based on the concept of limit values. Biological guidance values are based on an internal load of the general population. This value is used as an indicator to monitor possible exposure of occupants on working places. An OEL (in the air or in biolocical material) is not proposed in the evaluation report. However the calculated „Lung cancer exposure-risk relationship" of 0,5 µg/m3 complies to the currently valid national risk based concept (with an accepted risk value that based on the statistical probability of developing cancer of 4:10000) in the respirable dust fraction. For the inhalable dust fraction, a value of 1 µg/m³ is proposed. However, in our national risk based concept there is no concentration given for inhalable dust (see also Technical Rule for Hazardous Substances „TRGS 910 Risk-related concept of measures for activities involving carcinogenic hazardous substances" and the associated justification for cobalt				

metal and inorganic cobalt compounds).
The justification of exposure-risk relationship is currently being revised to examine possible new findings for modifying the tolerable and acceptable concentration. An update of the "GESTIS - International limit values for chemical agents (Occupational exposure limits, OELs)" is scheduled for early July. This could also include new values for cobalt and its inorganic compounds.

Currently, the IFA is in the process of establishing an "Analytical Methods" database. An extract from the database on analytical methods for the determination of cobalt and its inorganic compounds, as mentioned in Table 12, is attached.

ECHA note – An attachment was submitted with the comment above. Refer to public attachment Table_083-Cobalt 2022_rev_Z.pdf

ECHA/RAC Response

On the BGV, the RAC Opinion stresses that exceedance of the BGV should result in the identification of the exposure sources and to improvement of risk management measures at workplaces.

The German approach is described in the Annex.

Some of the analytical methods from the table have been included (in particular if they allowed reaching lower concentrations). Please note that the list of methods does not intend to be exhaustive, but to show whether there are methods available to show compliance with a proposed OEL (or potential for it). IFA's inititive to establish an "Analytical Methods" database is very welcome.

Date	Country	Organisation	Type of Organisation	Comment number
09.06.2022	United States of America	International Tungsten Industry Association	Industry or Trade Association	24

Comment received

Page 112 - Section 8.1.1. Consideration on Human Data

ECHA note – An attachment was submitted with the comment above. Refer to public attachment 2022_06_09 ITIA Cobalt-OEL Response.pdf

ECHA/RAC Response

As regards the epidemiological study by Marsh et al. (2017), already described in the scientific report that was subject to consultation, additional arguments have been included in an Appendix of the Annex of the Opinion.

Date	Country	Organisation	Type of Organisation	Comment number
09.06.2022	United Kingdom	Cobalt Institute	Industry or Trade Association	25

Comment received

The Cobalt Institute (CI) is submitting the following executive summary from the attached CI response document (see non-confidential attachments). The CI is also submitting the subsequent executive summary of Appendix 1 - Cardno ChemRisk Expert Opinion (see non-confidential attachments).

CI Response Document - Executive Summary

In July 2021, the European Commission outlined an intention to set EU-wide occupational exposure limit values for cobalt and cobalt compounds. This reflects a desire by both industry and by authorities to harmonise a cobalt OELV as part of better risk management. The Cobalt Institute (CI) is appreciative of the opportunity to submit comments into the public consultation (PC) opened by ECHA on 11th April, regarding the development of occupational exposure limit values for cobalt and inorganic cobalt compounds. The CI promotes the responsible and sustainable production and use of cobalt in all its forms and applications. The Institute aims to protect and grow the market for cobalt and compounds by promoting a proportionate regulatory environment. The CI is submitting comments specifically on:

- The ECHA proposed exposure-risk relationship for cobalt (Co) substances – where conservative assumptions have led to scientific concerns;
- Recommended re-evaluation of the breakpoint by weight-of-evidence consideration of available data, especially lack of cancer cases observed in a sufficiently powered and large epidemiology study;
- Available genotoxic and carcinogenic data that support threshold mode-of-action (MoA) for cobalt and cobalt substances;
- Efforts to address existing data gaps with 2018 and 2019 submission of testing proposals under REACH.

The CI has scientific concerns regarding the layers of conservative assumptions contained within the exposure-risk relationship for cobalt and cobalt substances. The assumptions within this non-threshold dose response relationship lead to an uncharacteristically high rate of cancer cases even at low exposures (i.e. below the calculated breakpoint) – cancer cases that have not been observed in recent, high quality negative epidemiology studies. This high cancer rate is not consistent with available recent high quality epidemiology studies, which show no increased risk in cancer even at higher exposures above the breakpoint. The CI agrees that it is difficult, but not impossible, to set a dose-response for cobalt carcinogenicity based on negative epidemiology data and rodent studies lacking a threshold for cancer, and are appreciative of RAC's scientific deviation from a default purely linear and very conservative dose-response. However, the essential biological role of cobalt and its extensive mechanistic, genotoxicity and toxicity data fit the overall profile of a carcinogen with a threshold mode-of-action and this is consistent with the available epidemiological data. By contrast, the current approach based on animal data yields a predicted excess cancer risk that cannot be reconciled with the lack of excess cancer cases observed in the epidemiology studies.

In light of the critical data gaps identified by RAC under the 5 cobalt salts restriction process, relating to quantitative thresholds for site-of-contact genotoxicity and inflammation, registrants submitted two testing proposals in 2019 under EU REACH that have not yet been evaluated (as of 9th June 2022) and would have been directly relevant to dose response consideration under the OELV process. These testing proposals would have generated quantitative in vivo threshold data through a 'local' site of contact comet assay and in vivo transgenic rodent assay. If, due to a lack of these critical data, a breakpoint approach is to be applied, CI highly recommends re-evaluation of where the breakpoint lies to reflect the essential biological role of cobalt, extensive genotoxicity database and negative epidemiology database. This can be achieved using the following considerations (please see Attachment 1 – Cardno ChemRisk expert opinion for a detailed analysis):

- Using species specific appropriate conversions;
- Application of appropriate assessment factors;

• Recent epidemiology data to assess the potential for excess cancer cases and slope factors;
• Cobalt-specific workplace data for derivation of a conversion factor to the inhalable fraction

The CI has noted that there are substances included in the potential scope that contain constituents other than cobalt that may take precedence in deriving a 'leading effect' for OEL setting. These substances should not be used in the current OEL setting, but rather CI recommends to investigate if the management of risks for these substances is adequately covered by a cobalt OEL, and if not, ensure the risk from the non-cobalt constituents is managed via regulation of these constituents. In addition, substances that belong to the poorly soluble (in both neutral and acidic aqueous fluids) / poorly reactive cobalt substance group were highlighted by ECHA as lacking sufficient sub/chronic data. CI again outlines the high quality, mode-of-action based tiered read-across approach performed under REACH, that indicates a lower potency and alternative cancer MoA for poorly soluble cobalt substances.

In 2018, registrants submitted a 90-day RDT inhalation testing proposal under EU REACH, to assess the sub-chronic inhalation toxicity of the poorly soluble / poorly reactive group of substances within the published CI read-across paradigm. The testing proposal has not yet been evaluated by ECHA (as of 9th June 2022), therefore the data has not been generated to further support the existence of this group by establishing if a different dose-response for longer term inhalation toxicity applies. The CI therefore recommends that ECHA refines the scope of the proposed OEL to only include cobalt and cobalt compounds that induce the combination of identified events in the cobalt mode-of-action for carcinogenicity, requiring the derivation of a cobalt specific health-based OELV.

The CI proposes that ECHA and RAC use a weight-of-evidence approach to assess cobalt and reactive cobalt compounds, taking into account toxicity, epidemiological and mode-of-action data; using high-quality scientific methodology to set practical OELVs. Combined, all evidence on the carcinogenicity of cobalt can be reconciled into one mode-of-action paradigm and into one exposure response with a good estimation of a breakpoint in the exposure response curve.

The CI outlines that continuing the OEL setting process without the data contained within three testing proposals would (1) not ensure that the adopted OELVs are based on all necessary and relevant information; (2) go against the EU Commission's Better Regulation commitments; and (3) be a missed opportunity to provide EU workplaces with a scientifically robust and fit-for-purpose OEL, enabling the continued existence and safe development of the EU cobalt industry which is key to the implementation of the EU's Green Deal objectives. For these reasons, the CI wishes to highlight the urgent need to ensure ECHA's prompt review and approval of the testing proposals submitted to generate the information that is necessary to enable ECHA, RAC and the Commission in setting the most relevant, protective and feasible cobalt OELV.

The CI welcomes any additional requests or clarifications from ECHA regarding the current submission and would appreciate the opportunity for cooperation and communication to lead to appropriate and practical risk management measures and limit values applied to cobalt and cobalt substances.

Attachment 1 - Cardno ChemRisk Expert Opinion - Executive Summary

Cardno ChemRisk now Stantec was asked by the Cobalt Institute to prepare comments on the recent publication by ECHA titled "ECHA Scientific report for evaluation of limit values

for cobalt and inorganic cobalt compounds at the workplace," published April 11, 2022. In this document, ECHA presents their scientific evaluation to derive limit values for cobalt and inorganic cobalt compounds and the cancer exposure-risk relationship. In addition, secondary considerations for dose-response relationships related to reproductive toxicity are also presented. This report summarizes our comments with respect to these two primary topics: the proposed cancer exposure-response relationship; and the reproductive toxicity-based occupational exposure limit value [OELV].

Briefly, these comments address the following potential concerns associated with ECHA's evaluation and recommendations:
• The "breakpoint" ECHA identified in the cancer exposure-response relationship is overly conservative owing to lack of consideration for dosimetry, use of unnecessarily conservative assessment factors, and lack of consideration on real-world size distributions of cobalt-containing dusts. The approach applied to cobalt should be consistent with the approach applied to nickel, a substance with a similar endpoint and mode of action. Consideration of these factors would result in an increased "breakpoint" of 9.5 µg respirable Co/m3 and, along with an update of the BMCL10 to reflect dosimetry, an increased inhalation unit risk (IUR) by approximately 3-fold.
• The available epidemiology data do not support the current exposure-response relationship for cancer proposed by ECHA. Notably, Marsh, et al. (2017) did not observe an exposure-response in relation to exposure to cobalt in a large cohort of workers. This study had sufficient statistical power to observe increased lung cancer risk when applying ECHA's proposed exposure-response relationship.
• The proposed reproductive OELV lacks consideration of biokinetic models available for inhalation of cobalt that permit the use of chemical-specific assessment factors; consideration of these factors would result in a substantial increase in the OELV protective of reproductive effects.

These themes are further expanded in this report. Based on these factors, we urge ECHA to reconsider their evaluation to reflect the currently available literature on cobalt and associated health effects.

ECHA note – An attachment was submitted with the comment above. Refer to public attachment CI Submission - Response Doc and App 1 - Cardno Report 2022June09.zip

ECHA/RAC Response

The evaluation of testing proposals is a process under REACH and is not connected to the evaluation of the scientific relevance of occupational exposure limits (OELs) for cobalt and inorganic cobalt compounds, which is related to the Directive 2004/37/EC on the protection of workers from the risks related to exposure to carcinogens mutagens or reprotoxic substances at work (CMRD). The current assessment is based on currently available data, and data potentially being generated later cannot be considered for the purpose of this Opinion.

The final decision on setting a BOEL and defining which substances are covered falls under the legislative procedures of the European Commission.

RAC considers that the exposure-response relationship earlier derived for local lung effects is still valid. The available scientific knowledge does not allow to extrapolate different (higher) thresholds based on distinct bioavailabilities (for poorly soluble cobalt compounds).

The lack of subchronic/chronic data on poorly soluble cobalt compounds is acknowledged. RAC however notes that in most exposure settings, workers are exposed to mixtures of cobalt compounds. Since the monitoring of exposure is based on analytical methods detecting total cobalt mass without speciation, individual cobalt species cannot be

separately monitored in mixed exposure scenarios. Therefore, RAC recommends that the proposed limits should be applied to all inorganic cobalt compounds.

It is noted that the Cobalt Institute (CI) has performed further analyses of the Marsh et al. (2017) pooled cohort as regards two aspects: (1) the study's statistical power to detect certain levels of risk (SMR) in the various exposure categories analysed and (2) comparison of predicted excess risks of the ERR and the observed numbers of cases in the highest exposure category of Marsh et al. (2017), i.e. what would the risk have been at certain assumptions of the exposure level in that (open-ended) exposure category assuming the ERR holds.

Some similar calculations and considerations have been included in the Appendix of the Annex to the RAC opinion. However, for the first issue above, it is noted that the power calculations by CI are made for relative risks of 1.5 and higher while the risks predicted by the ERR at levels of exposure in the Marsh et al (2017) cohort would indicate relative risks at or lower than that and thus a need for even higher statistical power (see further the Appendix of the RAC opinion). For the second issue above, it is noted that the SMR calculations made by the Cobalt Institute compare the life-time excess predicted by the ERR with the predicted observed numbers in Marsh et al. (2017) so far, which is less than would be observed had the cohort been followed for life-time which is the risk predicted by the ERR. The appendix of the RAC opinion (Annex 7 of the main Annex 1) includes similar calculations but using the ERR life-time predictions and general population life-time cumulative risk of lung cancer. Calculations are made also for the study of Sauni et al. (2017). Finally, that Appendix also acknowledges that the studies of Marsh et al. (2017) and Sauni et al. (2017) are negative in the sense that no increase of risk of lung cancer was observed for RAC to take into account when weighing all the evidence. Overall the above considerations allow to conclude that humans are not more sensitive than animals and that there is some indication of overestimation of human risk by the animal data based ERR. Thus no extra interspecies assessment factor seems warranted to adjust the ERR for higher risk of humans.

In the derivation of a hypothetical limit value for fertility effects using default assessment factors, the outcome indicates that the proposed OELs (for lung effects) are also protective for harmful effects on reproduction and fertility. No need to consider substance-specific assessment factors was identified.

Date	Country	Organisation	Type of Organisation	Comment number
09.06.2022	Spain	Inorganic Pigments Consortium	Industry or Trade Association	26

Comment received

INTRODUCTION
The Inorganic Pigments Consortium is the organization that manages the REACH and CLP obligations of manufacturers and importers of complex inorganic pigments into the EU. The Consortium currently includes 25 members from different European countries. The members of the IP Consortium are the largest producers in Europe for inorganic pigments.

Occupational health and safety are a top priority for our sector, and we appreciate the opportunity to submit comments to the ECHA Scientific report for evaluation of limit values for cobalt and cobalt inorganic compounds published on 11 April 2022.

The Inorganic Pigments Consortium fully supports the scientific and technical position of

the Cobalt Institute in relation to the present Public Consultation. The ECHA proposal for a non-threshold approach with breakpoint could be premature given the testing proposals that were submitted and existing epidemiological data supportive of a threshold in the dose-response for carcinogenicity.

Our comments are focused on the inclusion of several cobalt-containing complex inorganic pigments in the ECHA scientific report. We consider that the inclusion of these substances is not supported by the existing evidence and would not have any added value in terms of protection of human health at the workplace.

CHEMICAL AGENT IDENTIFICATION AND PHYSICO-CHEMICAL PROPERTIES

The ECHA scientific report refers to all inorganic substances containing cobalt for which data are available, regardless of their specific intrinsic properties. The discussion on the OEL setting process should however be limited to the cobalt-containing substances for which a relevant concern has been identified according to the Directive 2004/37/EC.

Complex inorganic pigments are chemical substances manufactured by means of an industrial process which involves a solid state chemical reaction. In this process, a mixture of raw materials (typically consisting of metal oxides and salts) undergoes a calcination reaction at high temperatures, forming a specific crystalline matrix. In general, complex inorganic pigments are poorly soluble and have very low reactivity. To support this, these pigments are used in high temperature applications due to their extreme durability which offers light fastness and weather stability. During the pigment manufacturing process, raw materials are transformed via calcination and the resulting inorganic pigments contain metal ions bound to the crystalline structure. The stability of their crystalline structure determines the intrinsic properties and behaviour of complex inorganic pigments, which are a specific type of chemical substances and cannot be assimilated to metal compounds.

Cobalt is a key raw material for the manufacture of some specific complex inorganic pigments to obtain certain colour ranges and cannot be substituted. The primary raw material in the manufacture of inorganic cobalt-containing pigments is tricobalt tetraoxide. During the calcination process, raw materials are completely consumed, and the resulting substance does not contain tricobalt tetraoxide nor any other cobalt containing raw material. The resulting pigment only contains cobalt cations and other ions tightly bound in a stable crystalline structure which imitates natural coloured minerals and gemstones.

These substances are exclusively manufactured at industrial sites by trained workers and their main end uses are ceramics, metals, plastics and paints or coatings.

EU HARMONISED CLASSIFICATION AND LABELLING - CLP (EC) 1272/2008

As indicated in table 5 of the ECHA report, Annex VI of CLP Regulation lists eight entries for the classification of cobalt and its compounds, and none of these entries correspond to complex inorganic pigments. None of the cobalt-containing pigments are included in Annex VI of CLP Regulation.

Moreover, the existing in vitro and in vivo studies on cobalt-containing complex inorganic pigments (see additional information in the confidential attachment) demonstrate their limited bioavailability and low toxicity.

CHEMICAL AGENT AND SCOPE OF LEGISLATION – REGULATED USES OF COBALT AND

COBALT INORGANIC COMPOUNDS IN THE EU

Table 6 in page 14 of ECHA scientific report contains the 18 inorganic cobalt substances registered in the highest quantities and representing over 99% of the tonnage reported. Among these 18 cobalt-containing substances, four complex inorganic pigments are included:

- Cobalt zinc aluminate blue spinel (EC# 269-049-5)
- Iron cobalt chromite black spinel (EC# 269-060-5)
- Olivine, cobalt silicate blue (EC# 269-093-5)
- Cobalt aluminate blue spinel (EC# 310-193-6)

Moreover, table 34 in Appendix 2 of ECHA scientific report (page 151) includes the complete list of REACH Registrations for inorganic cobalt compounds, which overall includes nine cobalt-containing complex inorganic pigments:

- Cobalt titanite green spinel (EC# 269-047-4)
- Cobalt zinc aluminate blue spinel (EC# 269-049-5)
- Iron cobalt chromite black spinel (EC# 269-060-5)
- Cobalt chromite blue green spinel (EC# 269-072-0)
- Olivine, cobalt silicate blue (EC# 269-093-5) 1
- Cobalt chromite green spinel (EC# 269-101-7)
- Iron cobalt black spinel (EC# 269-102-2)
- Cobalt zinc silicate blue phenacite (EC# 270-208-6)
- Cobalt aluminate blue spinel (EC# 310-193-6)

ECHA evaluation and recommendation is based mainly on the carcinogenicity of cobalt and inorganic cobalt compounds. However, none of the cobalt-containing inorganic pigments mentioned in the report meets the criteria to be classified as carcinogen under the CLP Regulation.

- With respect to the substance Cobalt titanite green spinel (EC# 269-047-4), several classifications notified to the C&L inventory include a classification as Carcinogen 1A, affected by impurities. This classification is exclusively due to the presence, in certain compositions of this substance, of nickel titanium trioxide as impurity and is not related to the content of cobalt in this substance.

- With respect to the presence of other constituents of potential concern in these substances, several cobalt-containing pigments mentioned in the ECHA scientific report contain chromium in their composition. We would like to clarify that chromium is exclusively present as trivalent chromium. A determination of hexavalent chromium by Differential Pulse Polarography conducted in all pigments confirmed the absence of hexavalent chromium.

HEALTH EFFECTS / TOXICOLOGICAL DATA

Complex inorganic pigments are in general poorly soluble substances with low toxicity. The available in vitro and in vivo studies for cobalt-containing inorganic pigments are included in the respective REACH Registration dossier for each substance (see additional information in the confidential attachment).

Repeated dose toxicity studies in rats conducted on the substance cobalt zinc aluminate blue spinel by oral and inhalation route showed no toxic effects up to the maximum dose tested. A pre-natal developmental toxicity study in rats with the same substance

confirmed the lack of adverse effects.

All available evidence confirms that cobalt-containing complex inorganic pigments do not have any of the properties of concern that would justify the setting of an EU-wide Occupational Exposure Limit for these substances.

CONCLUSION AND FINAL REMARKS

The Inorganic Pigments Consortium considers that the inclusion of nine cobalt-containing inorganic pigments in the ECHA scientific report or their consideration in the scope of an EU-wide OEL setting process for cobalt inorganic compounds is unjustified.

The OEL setting process should be targeted at substances for which sufficient evidence exists of their risks for the human health, as intended by the occupational safety and health legislation. Due to their intrinsic properties and behaviour, cobalt-containing inorganic pigments should be excluded from the scope of the OEL setting process for cobalt and inorganic cobalt compounds, given that their inclusion would not bring any benefit in terms of health protection at the workplace.

ECHA note – An attachment was submitted with the comment above. Refer to public attachment IP Consortium Cobalt OELs Public Consultation_NON CONFIDENTIAL.pdf
ECHA note – An attachment was submitted with the comment above. Refer to confidential attachment IP Consortium Cobalt OELs Public Consultation_CONFIDENTIAL ATTACHMENT.pdf

ECHA/RAC Response

As the scope of the assessment is Cobalt and inorganic cobalt compounds, also inorganic pigments containing cobalt are included. RAC noted that long-term toxicity data on poorly soluble cobalt compounds is limited, which prevents their full assessment and the derivation of a separate OEL(s).
The proposed OELs, differentiating respirable from inhalable fractions, are expected to protect workers also from the potential hazards of poorly soluble cobalt compounds, like complex inorganic cobalt pigments.

The final decision on setting a BOEL and defining which substances are covered falls under the legislative procedures of the European Commission.

The chapter 5.2.5 of Annex 1 (Manufacture of pigments and dyes) was modified to contain detailed information on inorganic pigments.

Date	Country	Organisation	Type of Organisation	Comment number
09.06.2022	Belgium	EUROFER	Industry or Trade Association	27

Comment received

EUROFER fully supports the scientific position of the Cobalt Institute (CI) contained within the document 'CI Response to the ECHA PC on the Co OELV' and submitted into this PC for the development of occupational exposure limit values.
We highlight that the ECHA proposal for a non-threshold approach with breakpoint could be premature given the testing proposals that were submitted and existing epidemiological data supportive of a threshold in the dose-response for carcinogenicity.

ECHA/RAC Response

The assessment is based on currently available data, and data potentially being generated later cannot be considered for the purpose of this report. A comparison of epidemiological data with the animal data derived ERR is added and presented in Appendix 7 of Annex 1.

Date	Country	Organisation	Type of Organisation	Comment number
09.06.2022	France	Francéclat, BOCI, FHITM and UFBJOP	Industry or Trade Association	28

Comment received

Use of cobalt salts in the jewellery and watchmaking sectors
Submission produced by
The Jewellery-making, Gold Jewellery-making and Silversmiths, Gift Makers and Decorative Arts Industries Trade Association (BOCI)
France Horlogerie – Time and Microtechnics Industries (FHITM)
The French Union of Jewellery, Silverware, Gems and Pearls (UFBJOP)
And
Francéclat, the French Watch, Clock, Jewellery, Silverware and Tableware Committee

We participate in the public consultation on the Occupational Exposure Limits Report of Cobalt and inorganic cobalt compounds in order to provide the information we have on the use of certain cobalt salts in the watchmaking and jewellery sectors and to provide information on worker exposure to cobalt, based on exposure measurements carried out in 2018 in companies' representative of our activities.

Use of cobalt salts in the watchmaking and jewellery sectors and exposure

A) Use, exposure, risk management measures in place and substitution:

Cobalt salts are used in the watchmaking and jewellery sectors in surface treatment processes for the deposition of metal alloys (metallic coatings applied by electroplating or galvanic processes). Cobalt sulphate is the main cobalt salt used. It is found in some pre-gilding baths and gilding baths. The alloys deposited are composed of 94 to 98 % fine gold.

In our sectors, these processes are either subcontracted to companies specialising in electroplating or, in the case of the largest companies, performed by the jewellery and watch-part manufacturers themselves in-house.

The amount of cobalt salts consumed by our sectors is extremely low. It represents a tiny fraction of their global use and even of their use in the surface treatment field.

The size of the tanks used for applications in the watchmaking and jewellery sectors is mainly 100 litres or less and never exceeds 250 litres. Moreover, the cobalt salts are in extremely low concentration in the baths, between 0,1 and 5 %.

The levels of exposure to cobalt salts linked to these activities are very low given the low concentration in the baths and the small volume consumed, and also because:

- the companies performing these coatings all use baths already prepared upstream (sometimes by their supplier or even higher up the supply chain). The latter are never used in powder form;

- the electroplating processes concerned are carried out at ambient temperature or at

temperatures which never exceed 40°C. This limits the release of vapour and therefore the risk of exposure;
- all tanks are fitted with local exhaust ventilation, whether in electroplating companies or in jewellery or watch-part manufacturing companies. These may be circular tanks with integrated extraction systems or rectangular or square tanks with lateral extraction (integrated or otherwise).

In the case of applications using cobalt salts in the watchmaking and jewellery sectors, there is no satisfactory substitution product from a technical and economic point of view.

B) Results of exposure measurements:

A measurement campaign was held during 2018 in order to supplement our information concerning levels of exposure to cobalt salts in the applications of our sectors.

These additional measurements were carried out in three companies representative of our sectors: 2 electroplating companies specialised in surface treatment for the watchmaking, jewellery and fashion accessory sectors and one company making watch components. At least two workers in each company were monitored.

The methodology used to make these measurements was that used to monitor the exposure of workers to hazardous chemical agents in the atmosphere in the workplace. The measurements correspond to the inhalable fraction of cobalt metal.

i) Sampling and analysis methodology

Two companies accredited with COFRAC, the French accreditation body, for Occupational Exposure Limit (OEL) measurements respectively conducted the sampling and analyses.

The French order of 15 December 2009 on "technical controls of occupational exposure in workplace atmospheres and conditions for accrediting the organisations in charge of controls", which is the provision set up to transpose the European provisions, was used as a reference with regard to the sampling and analysis. The methodology sheets in the INRS MétroPol (the National Research and Safety Institute database including over 80 procedures specific to a substance or a chemical family and methodology sheets that take stock of more general aspects of the methods used for sampling and analysis) and standard NF EN 482+A1 of November 2015 "Workplace exposure - General requirements for the performance of procedures for the measurement of chemical agents" were also followed.

Measurement of workers' exposure was carried out by individual sampling according to standards NF X43-275 "Air quality - Workplace air - Determination by atomic spectrometry of elements present in workplace air" and NF X43-257 "Air quality - Workplace air - Aerosol sampling using a cassette (4 mm inlet orifice)". The samples were taken over a representative period and the device's sampling heads were placed at the height of workers respiratory tracts. The sampling times and flows were also adapted to the nature of the cobalt chemical species, its concentration in the atmosphere and the specific nature of the media used.

After the samples were taken, they were sent to the analysis laboratory as quickly as possible. If they were not sent on the same day, the samples were kept in a suitable clean environment before being sent to the laboratory.

The analysis method used to determine the amount of cobalt was the microwave

digestion method and ICP/MS analysis (mineralisation of the filter membrane) according to standard NF ISO 30011 "Workplace air — Determination of metals and metalloids in airborne particulate matter by inductively coupled plasma mass spectrometry", for which the corresponding limit of quantification provided by the analysis laboratory is 0,1 µg Co/filter.

The sampling and analysis uncertainties were provided and are 10 % for sampling and 14 to 16 % for the analyses.

ii) Tables of results

Please see the attached document.

All the exposure levels measured as part of our measurement campaign were lower than the limit of quantification given by the analysis laboratory, i.e., 0,1 µg Co/filter, and are therefore between lower than 0,12 µg Co/m3 and lower than 0,23 µg Co/m3 depending on the sampling time (4 to 7 hours) and with a flow rate of 2 l/min.

It is important for the exposure values imposed to be measurable and controllable by the companies (and by the inspection bodies) and therefore to ensure before they are defined that suitable analysis methods are available (with appropriate limits of quantification).

ECHA note – An attachment was submitted with the comment above. Refer to public attachment Measurements campaign 2018.pdf

ECHA/RAC Response

The use of cobalt salts in watchmaking and jewellery sectors has been added to the section 5.2.6 of Annex 1. Also the provided measured exposure levels have been included to the section 5.3 and the further information you provided has been taken into account.

Date	Country	Organisation	Type of Organisation	Comment number
09.06.2022	Poland	IGMNIR	Industry or Trade Association	29

Comment received

On behalf of Members of the Izba Gospodarcza Metali Niezelaznych i Recyclingu (IGMNIR) we fully supports the scientific position of the Cobalt Institute (CI) contained within the document 'CI Response to the ECHA PC on the Co OELV' and submitted into this Public Consultation for the development of occupational exposure limit values.

IGMNiR highlights that the ECHA proposal for a non-threshold approach with breakpoint could be premature given the testing proposals that were submitted and existing epidemiological data supportive of a threshold in the dose-response for carcinogenicity.

ECHA/RAC Response

The assessment is based on currently available data, and data potentially being generated later cannot be considered for the purpose of this report. A comparison of epidemiological data with the animal data derived ERR is added and presented in Appendix 7 of Annex 1.

Date	Country	Organisation	Type of Organisation	Comment number

09.06.2022	Sweden	Nordic Expert Group for Criteria Documentation of Health Risks from Chemicals (NEG)	International NGO	30
Comment received				
See attachment ECHA note – An attachment was submitted with the comment above. Refer to public attachment NEG comments on ECHA cobalt 2 June 2022.pdf				
ECHA/RAC Response				
Your detailed comments have been considered and several corrections or editorial changes have been implemented and details have been specified in the in the Opinion and/or Annex 1. Regarding your comment on a comparison between estimates on urine/air ratios, there are indeed some differences in the estimates published in different reports. It is difficult to do an extensive comparison, and there is anyhow no proposal for a BLV. In the Opinion some calculations were made using the different correlations, and in all cases, the urinary levels corresponding to inhalation exposure at the OEL concentration are very close to the population background levels. Regarding your comment proposing the deletion of table 14, it is considered useful to explain the basis of the EKA correlation. The original EKA correlation was developed based on the correlations shown in the table. The later assessemnts confirmed this correlation as adequate and extended the correlation to lower concentration ranges. We acknowledged that the units for the concentrations of cobalt in air and urine were missing and have now been added to the table. On your comment to provide a comparison of the reported bioavailabilities and the respective solubilities of the different cobalt compounds, no detailed comparison was performed for the purpose of this report. RAC noted that the available scientific knowledge does not allow to extrapolate higher thresholds based on distinct bioavailabilities, and the identification of a distinct threshold for poorly soluble cobalt compounds substances is not possible due to insufficient toxicological data.				

Date	Country	Organisation	Type of Organisation	Comment number
09.06.2022	Belgium	Umicore NV	Company Manufacturer	31
Comment received				
Umicore fully supports the scientific position of the Cobalt Institute (CI) contained within the document 'CI Response to the ECHA PC on the Co OELV' and submitted into this PC for the development of occupational exposure limit values. We highlight that the ECHA proposal for a non-threshold approach with breakpoint could be premature given the testing proposals that were submitted and existing epidemiological data supportive of a threshold in the dose-response for carcinogenicity				
ECHA/RAC Response				
The assessment is based on currently available data, and data potentially being generated later cannot be considered for the purpose of this report. A comparison of epidemiological data with the animal data derived ERR is added and presented in Appendix 7 of Annex 1.				

PUBLIC ATTACHMENTS
1. 2022-06-10_VDMA-Position_ECHA.pdf [Please refer to comment No. 9]
2. Anses comments ECHA OEL cobalt 20220610 .zip [Please refer to comment No. 12]
3. CI Response ECHA PC Co OEL - Exeuctive Summary 2022June05.pdf [Please refer to comment No. 13]
4. CI Response ECHA PC Co OEL - Exeuctive Summary 2022June05.pdf [Please refer to comment No. 14]
5. ECHA-Stellungnahme_10_06_2022.docx [Please refer to comment No. 16]
6. 220610_Comm_FB4_BAuA_OEL_Report_Cobalt.docx [Please refer to comment No. 19]
7. 20220602_ETRMA_Position_OEL_Cobalt_VF.pdf [Please refer to comment No. 21]
8. Table_083-Cobalt 2022_rev_Z.pdf [Please refer to comment No. 23]
9. 2022_06_09 ITIA Cobalt-OEL Response.pdf [Please refer to comment No. 24]
10. CI Submission - Response Doc and App 1 - Cardno Report 2022June09.zip [Please refer to comment No. 25]
11. IP Consortium Cobalt OELs Public Consultation_NON CONFIDENTIAL.pdf [Please refer to comment No. 26]
12. Measurements campaign 2018.pdf [Please refer to comment No. 28]
13. NEG comments on ECHA cobalt 2 June 2022.pdf [Please refer to comment No. 30]
14. 20220607_CERATIZIT_Response ECHA.pdf [Please refer to comment No. 1]
15. CI Response ECHA PC Co OEL - Exeuctive Summary 2022June05.pdf [Please refer to comment No. 6]

CONFIDENTIAL ATTACHMENTS
1. Reply to the public consultation regarding the occupational exposure limits for cobalt and cobalt compounds MICHELIN.pdf [Please refer to comment No. 18]
2. IP Consortium Cobalt OELs Public Consultation_CONFIDENTIAL ATTACHMENT.pdf [Please refer to comment No. 26]