

### NAMC - US-EPA MEETING

# MOLYBDENUM RISK ASSESSMENT DATASET

12 JUNE 2013 WASHINGTON, USA



### **Basic Information:**

- a) Mo is an essential trace element for plants and mammals
- b) Main uses for Mo and compounds include:
  - ✓ Alloying element in the production of stainless steel, tool steels, high speed steels, carbon steels and alloys
  - ✓ Corrosion inhibitor
  - ✓ Catalysts
  - ✓ Lubricants & greases



### Global usage of molybdenum and compounds:

### First Use of Molybdenum 2011 (Primary+Mo in Scrap)

Mo-Input in Material Categories 2011			
Category	Quantity in t	Share in %	Change to '10 in %
Constructional Eng. Steels	113,940	36%	14%
Stainless Steels	82,770	26%	19%
Alloy Tool Steel	21,660	7%	4%
High Speed Steel	13,920	4%	13%
Super Alloys	14,860	5%	11%
Cast Iron & Steels	25,150	8%	3%
Subtotal Metallurgical	272,300	86%	13%
Molybdenum Metal	12,300	4%	10%
Chemicals	33,070	10%	8%
Subtotal Other First Uses	45,370	14%	8%
TOTAL	317,670	100%	12%

Metallurgical applications are by far most important for the Mo market with a share of 86% last year, whilst Mo Metal and Mo chemicals count combined for 14% of the first use.



# A MUCH SUPERIOR RISK ASSESSMENT DATASET IS NOW AVAILABLE FOR MOLYBDENUM AND ITS COMPOUNDS THAN WAS THE CASE JUST 5 YEARS AGO .......

MAIN DRIVER: EU REACH REGULATION



### **EU REACH Regulation (2006 – to-date)**



www.molybdenumconsortium.org

➤ 60 member companies, from 19 countries worldwide, have to-date invested > US\$6 million in the preparation of robust risk assessment dossiers for 12 molybdenum substances.



### MoCon Membership:

### Molybdenum Consortium

MEMBERSHIP LIST - UPDATED May 2013

(2012-2013 Steering Committee in blue) AFE (FRANCE)

ALBEMARLE EUROPE (BELGIUM)

ANTOFAGASTA (CHILE)

AXENS IFF GROUP TECHNOLOGIES (FRANCE)

BAREX RESOURCES INC. (USA)

BASE (GERMANY)

CHEVRON MINING INC. (USA)

CODELCO-CHILE (CHILE)

CHINA MOLYBDENUM CO. LTD (CHINA)

CLIMAX MOLYBDENUM CO. (USA)

COMMERCIAL METALS CO. (USA)

COMMODITY RESOURCES INC. (ISRAEL)

COMSUP LTD (USA)

CRI/CRITERION INC. (USA)

CRONIMET HOLDING GmbH (GERMANY)

DEREK RAPHAEL & CO. LTD (UK)

**EURECAT France S.A.S (FRANCE)** 

ERAMET SA (FRANCE)

EVONIK DEGUSSA GMBH (GERMANY)

**EXXONMOBIL (BELGIUM)** 

FORMOX HOLDING AB (SWEDEN)

FW HEMPEL GMBH (GERMANY)

GENERAL MOLY INC. (USA)

G(M FESIL GMBH (GERMANY)

GLENCORE INTERNATIONAL AG (SWITZERLAND)

GRAND BUILD METAL INT. CO. LTD (CHINA)

GRACE GMBH & CO. KG (GERMANY)

GRONDMET METALL-UND ROHSTOFFVERTRIEBS

GmbH (GERMANY)

HALDOR TOPSOE A/S (DENMARK)

HARBIN SONGJIANG COPPER Co. Ltd (CHINA)

HERMES ALLOYS (SWITZERLAND)

HOEGANAES CORPORATION EUROPE GmbH

(ROMANIA)

HOGANAS AB (SWEDEN)

INEOS COMM. SERVICES UK LTD (UK)

JINDUICHENG MOLYBDENUM CO, LTD (CHINA)

METEK-METAL-TECH LTD (ISRAEL)

METHERMA KG (GERMANY)

MINALEG FERROALLOYS, ORES & OXIDES SA

(SWITZERLAND)

MOLYMET S.A. (CHILE)

MOLYPLUS (CHINA)

MOLY MINES LTD (AUSTRALIA)

PLANSEE SE (AUSTRIA)

POWMET INC (USA)

QUIMETAL INDUSTRIAL SA (CHILE)

RIO TINTO PLC (UK)

R.T. VANDERBILT INC. (USA)

SCANDINAVIAN STEEL AB (SWEDEN)

SCG EUROPESA (UK)

SHERWIN WILLIAMS CO. (USA)

SIDECH (BELGIUM)

SOUTHERN COPPER CORP. (PERU & MEXICO)

STRIKEFORCE MINING & RESOURCES

(SWITZERLAND)

SUD-CHEMIE CATALYSTS ITALIA SRL (ITALY)

TRAXYS EUROPE SA (LUXEMBOURG)

TREIBACHER INDUSTRIE AG (AUSTRIA)

THE CHEM-METCO COMPANY (USA)

THOMPSON CREEK METALS CO. (USA)

TODINI GROUP SPA (ITALY)

WOGEN RESOURCES LTD (UK)

WYSE WAY LTD (UK)

TOTAL MEMBERSHIP: 60 + IMO A



### **MoCon REACH registrations > 1000 tonnes dossiers:**

### Registered 11 molybdenum substances in 2010

- molybdenum, Mo
- molybdenum dioxide, MoO<sub>2</sub>
- molybdenum trioxide, MoO<sub>3</sub>
- roasted molybdenite concentrate (=technical grade molybdenum trioxide, UVCB)
- sodium molybdate, Na<sub>2</sub>MoO<sub>4</sub>
- ammonium dimolybdate, (NH<sub>4</sub>)<sub>2</sub>Mo<sub>2</sub>O<sub>7</sub>
- ammonium heptamolybdate, (NH<sub>4</sub>)<sub>6</sub>Mo<sub>7</sub>O<sub>24</sub>
- ammonium octamolybdate, (NH<sub>4</sub>)<sub>4</sub>Mo<sub>8</sub>O<sub>26</sub>
- calcium molybdate, CaMoO<sub>4</sub>
- iron molybdate, Fe<sub>2</sub>(MoO<sub>4</sub>)<sub>3</sub>
- ferromolybdenum slags (UVCB)

### One further dossier submitted in July 2012

EINECS 235-721-1: chemically-produced molybdenum disulfide, MoS<sub>2</sub>

### Key products that do not require registration:

**molybdenite** (naturally-occurring ore concentrate, not chemically modified) **ferromolybdenum** (special preparation, covered by registrations of Mo metal and Fe metal)



### MoCon Read-Across Rationale:

The physiologically and environmentally-relevant significant species is the  $MoO_4^{2-}$  ion.

At the pH's and Mo concentrations that interest us for REACH, Mo compounds transform to  $MoO_4^{2-}$  and enter the organism as such.



### Risk Assessment Frameworks: MERAG & HERAG

MERAG

Metals Environmental Risk Assessment Guidance

Testing, research and read-across basis included:

- ✓ Speciation: (UV spectra for species analysis in water)
- ✓ Bio-availability: HH: Bio-elution in synthetic bodily fluids Env: Transformation Dissolution protocol
- √ Toxicokinetics
- ✓ Essentiality







MERAG: Metals Risk Assessment Guidance

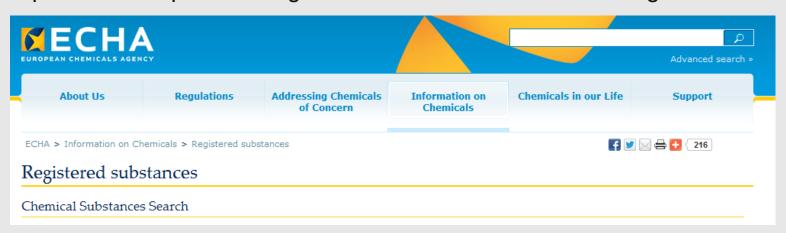
HERAG: Health Risk Assessment Guidance



# Enhancing data availability to general public and scientific/academic communities via:

1) REACH Dissemination Portal:

http://echa.europa.eu/web/guest/information-on-chemicals/registered-substances



2) Publication of REACH research in peer-reviewed technical journals:



## 2012 Publications in peer-reviewed journals



#### The chronic toxicity of molybdate to marir effects data

D.G. Heijerick a.\*. L. Regoli b. W. Stubblefield c

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#### ARTICLE INFO

Article history: Received 11 January 2012 Received in revised form 19 March 2012 Accepted 19 March 2012 Available online 2 June 2012

Sodium molybdate Aquatic toxicity Species sensitivity distribution

#### ABSTRACT

A scientific research program addressed identified gaps in were previously identified di pounds (European Union reg substances; EC, 2006). Evalua that could be used for derivi Rather than calculating a PN marine dataset, IMOA decide PNEC by means of the more s the statistical extrapolation a sodium molybdate dihydrate acceptable for a broad range typical marine trophic levi

### **Marine**



The toxicity of molybdate to freshwater and marine organisms. II. Effects assessment of molybdate in the aquatic environment under REACH

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<sup>b</sup> International Molybdenum Association, 4 Heathfield Terrace, London, W4 4JE, United Kingdom

#### ARTICLE INFO

Article history: Received 11 January 2012 Received in revised form 10 May 2012 Accepted 22 May 2012 Available online xxxx

Molybdate Fre shwater as sess ment

#### ABSTRACT

The REACH Molyhde PNECs, based on the part of the REACH do international regulati Chronic ecotoxicity of derivation of PNECs established by the Eu Species Sensitivity I water compartment PNEC franchistant of 12.

### Freshwater & marine PNEC derivation

Science of the Total Environment 435-436 (2012) 96-106

Contents lists available at SciVerse Science Direct

Science of the Total Environment

journal homepage: www.elsevier.com/locate/scitotenv



Bioconcentration

The bioconcentration and bioaccumulation factors for molybdenum in the aquatic environment from natural environmental concentrations up to the toxicity boundary

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#### ARTICLE INFO

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Keywords: Molybdate Bioaccumulation Bioconcentration Aquatic environment

In a regulatory context, bioaccumulation or bioconcentration factors are used for considering secondary poison ing potential and assessing risks to human health via the food chain. In this paper, literature data on the bioaccumulation of molybdenum in the aquatic organisms are reviewed and assessed for relevance and reliability. The data available in the literature were generated at exposure concentrations below those recommended in the REACH registration dossiers for molybdenum compounds i.e. PNEC<sub>fre</sub> To address possible environmental concerns at regulatorily-relevant molybdenum concentrations, both a field study and a laboratory study were conducted. In the field study, whole body and organ-specific molybdenum levels were evaluated in fish (eel, stickleback, perch, carp bream, roach) held in the discharge water collector tanks of a molybdenum processing plant, containing a mean measured molybdenum level of 1,03 mg Mo/L. In the laboratory study, rainbow trout were exposed to two different nominal molybdenum levels (1.0 and

in fish



### List of Publications about IMOA's REACH Molybdenum Consortium Research

Subject	Name of Paper	Reference	Available from	Data Source
Freshwater	"The chronic toxicity of molybdate to	Science of the Total	http://www.journals.elsevier.com/science-of-the-total-	MoCon
organisms	freshwater organisms. I. Generating	Environment 480	environment/	(with CIMM,
effects	reliable effects data" by K.A.C.de	(2010) 5362-5371		Parametrix,
generation	Schamphelaere			Univ Ghent)
Marine	"The chronic toxicity of molybdate to	Science of the Total	http://www.journals.elsevier.com/science-of-the-total-	MoCon with
organisms	marine organisms. I. Generating	Environment 430	environment/	(ABC Labs,
effects	reliable effects data", by D.G.	(2012) 260-269		Aquasense,
generation	Heijerick.			AstraZeneca
				Brixham,
				Parametrix)
PNEC	'The toxicity of molybdate to	Science of the Total	http://www.journals.elsevier.com/science-of-the-total-	MoCon
derivation –	freshwater and marine organisms. II.	Environment 435-	environment/	(with
freshwater	Effects assessment of molybdate in	436 (2012) 179-187		ARCHE)
and marine	the aquatic environment under			
	REACH,' by D.G. Heijerick			
BCF-BAF	"The bioconcentration and	Science of the Total	http://www.journals.elsevier.com/science-of-the-total-	IMOA
freshwater	bioaccumulation factors for	Environment 435-	environment/	(with
fish study	molybdenum in the aquatic	436 (2012) 96-106		Oregon
	environment from natural			State
	environmental concentrations up to			University)
	the toxicity boundary", by L. Regoli.			
SOILS	"Influence of soils properties on	Chemosphere.	http://www.journals.elsevier.com/chemosphere/	MoCon
TOXICITY	molybdenum uptake elimination	80(2010) 1036-1043		(with Univ.
DATA	kinetics in the earthworm Eisenia			Vrije,
	Andrei", by M. Diez-Ortiz et al, 2010.			Netherlands)
SOILS	"Predicting molybdenum toxicity to	Environmental	http://www.journals.elsevier.com/environmental-pollution/	MoCon
TOXICITY	higher plants: influence of soil	Pollution.		(With
DATA	properties" by S. McGrath et al, 2010.	158: 3095-3102		Rothamsted
		l		Inst., UK)

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SOILS	"Predicting molybdenum toxicity to	Environmental	http://www.journals.elsevier.com/environmental-pollution/	MoCon
TOXICITY	higher plants: estimation of toxicity	Pollution.		(with
DATA	threshold values" by S. McGrath et al,	158: 3085-3094		Rothamsted
	2010.			Inst., UK)
SOILS	"The bioaccumulation of	Chemosphere.	http://www.journals.elsevier.com/chemosphere/	MoCon
TOXICITY	molybdenum in the earthworm	82(2011) 1614-1619		(with Univ.
DATA	Eisenia andrei: influence of soil			Vrije,
	properties and ageing" by C. Van			Netherlands)
	Gestel et al. 2010			
SOILS	"Effect of long-term equilibration on	Environmental	http://www.sciencedirect.com	MoCon
TOXICITY	the toxicity of molybdenum to soil	Pollution 162 (2012)	(Note: Although MoCon has seen a copy of this published	(with Univ.
DATA	organisms" by C. Van Gestel et al.	1e7	article we were unable to locate it on-line!)	Vrije,
	2011			Netherlands)
SOILS	"Toxicity of the molybdate anion in	Environmental	http://onlinelibrary.wiley.com/doi/10.1002/etc.162/abstract	MoCon
TOXICITY	soil is partially explained by effects of	toxicology and		(with Univ.
DATA	the accompanying cation or by soil	chemistry. Vol. 29,		Leuven,
	pH" by J. Buerkers et al. 2009	No. 6, pp 1274-1278		Belgium)
		2010		
SOILS	"Aging effects on molybdate lability	Chemosphere.	http://www.journals.elsevier.com/chemosphere/	MoCon
TOXICITY	in soils" by J. Kirby et al. 2012	89(2012) 876-883		(with CSIRO,
DATA				Australia)

#### Notes:

In order not to breach copyright rules MoCon-IMOA cannot supply you with copies of these publications but you can order them directly on-line from the journal, using the links and references above. Each one costs approximately US\$40.



### **Coming soon: Fact Sheets**

#### DRAFT Fact Sheet: Freshwater Risk Assessment of Molybdenum



Introduction: The minimum requirements under REACH-Annex 10 for the derivation of a PNEC for the equation environment are chemic toxicity data for at least three trophic levels: algae, invertebrates and (assessment factor methodology). When a large data set for different taxonomic goups is available, the PNEI can also be calculated by means of a scientifically more robust statistical extrapolation method. The extrapolation method is based on a species sensitivity distribution (550), which can be developed when at least 10 direntedata points, representing at least 5 different tropic levels, are available. In this approach, the exotoxicity data are ranked from low (most sensitive species) to high (least sensitive species). After applying an appropriate fitting distribution to the data, a HC<sub>etter</sub> is calculated. To account for uncortainty, an additional Africowoon 1 and 5 is applied to the HC<sub>cros</sub>, The freshwater PNEC is calculated as follows:

Assessment Feder (Af) method: PNEC<sub>tobase</sub> = lowest NGEC/EC<sub>12</sub> / 10

Statistical extrapolation method: Michigana + HC<sub>CDX</sub> / AF (AF ranging between 1 and 5)

#### Derivation of the Predicted No Effect Concentration (PN EC) for molybdate

Fow reliable chronic no-effects data are available in open literature for molybdate - the only molybdonum speciation from that is found under normal environmental conditions. A thorough evaluation of these data, applying the criteria of Klimbath et al (1997), showed that the majority of these studies should not be considered for regulatory purposes.

Sead on the outcome of this literature review, IMDA commissioned a research testing program. aimed at generating the data recessary to:

- Develop a freshwater species sensitivity distribution for molyblate.
- Dorive a HC<sub>COX</sub> which serves as a dirente reference value for molybdonum in the freshwater environment
- Determine a PNEC for the freshwater environment.

With regard to the freshwater environment, the London Workshop (2001) defined eight different taxonomic goups that should be included in the effects detabase when deriving a PNSC in accordance with the 350-approach (guidance adopted in SCHA Guidance Document, Chapter 510() (5CHA, 2008).



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- A family in a phylum other than Arthropoda or Chordata (e.g., Rotifers, Arnelida, Mellusca, etc.)

#### DRAFT Fact Sheet: Marine Risk Assessment of Molybdenum



#### Introduction:

SCHA guidance on PNE-derivation allows Advantage of the SSD-methodology the derivation of a PNEC for the marine PNEC parks is based on marine thronic data, and not are available. This method is based on a NOSC/SC10. different taxonomic groups are available. environment.

environment by means of the scientifically derived by the application of a conservative more robust statistical extrapolation assessment factor (AP) of 10 on the lowest marine method (ECHA, 2006) when sufficient data NOSC/EC 2, or an AF of 100 on the lowest freshwater

species sensitivity distribution (330) that In the case of molybdonum, however, the 330can be developed when at least 10 chronic approach required the generation of almost a data points representing & (or more) complete chronic ecotoxicity dataset for the marine

With regard to the freshwater environment, The London Workshop (2001) defined eight different Exponemic groups that should be included in the effects database when deriving a PNEC in accordance with the 350-approach (guidance adopted in BCHA Guidance Document, Chapter #10 (BCHA, 2005); no specific guidance on specific marine taxonomic groups was provided. Species in the marine data set should cover eight different trophic levels that are relevant/typical for the marine environment, and that have additional ecological and/or economic value.

Spenden	Indiposit	Reference of quality label (September 4, 2007)
Ference Common	900-LCa: 22 Glorg Majl.	Enathernovan Ryan 180 - C1
Medican late	BOR-LCa: 2013 mg Mg/L	Enable and Van Ryse; 1800 - 01
Cjerine Demontopolia	901-10a: 2027 mg Mg/L	Continued Van Spay 1800 - 01
Crementer rigidae	900-10a: 3373 mg Mg/L	Englished Van Ryse 180 - 01
Minds	628-9Cas 1 C mg Mg/L 628-9Cas 6.6 mg Mg/L M paramatan Garatapanani	Margan et al, 1800-01
Mercennolis	800-10a:2788 mg Mg/L	Dayse of al, 1992-02
Madeso date	BOS-LOW SECURE Majo	Cer, 1297-02
Drawni yr afy si stery dade	900-LCar > 1000 mg Mayl.	Hamilton & Build, SMC-CS
Drawn malestacks	BOR-LCa. > 1000 mg Majl.	Hamilton & Build, SMC-CS
Constructions	030-7.m. 2030-3253 mg Mg/L	466+11, 1977-CB
Speraga limbella	020-70m 189-230mg Meyl.	466+11, 1977-CB
Salarian ruliera	100-Ten 17-130mg No.A	466+11, 1977-CB
Verenalization	101-1.m. 100-009 mg Maj.	466+11, 1977-CB
Stateterane	900-10a: 3073 mg Mg/L	Standard 1822
Smradium piedes	610-1.m 340 og Mejl.	When and Fredery 180 - CS
Smellelen bil	010-10-100 mg Naj.	When and heading 1800 - 08
bealigning affices	628-70m 1008 00 mg Mayl.	When and Freedomy 1862 - CS
Takabatan dara	638-7Lm 3400 mg Mg/L	When and fracting 1800 - 03

- Rederivation of \$010 based on raw data reported in Morean et al. 1995.
- Q1: Reliable data for risk assessment purposes (PNEC-derivation, classification)
- Q2: Reliable with restrictions for risk assessment purposes
- Q2: Non-reliable data for risk assessment purposes

### DRAFT Fact Sheet: Bioaccumulation of Molybdenum



#### Introduction:

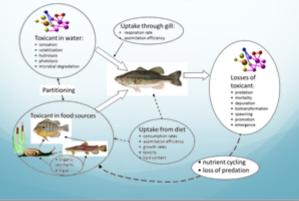
Bloaccumulation or bioconcentration factors are used for considering secondary poisoning potential and assessing risks to human health via the bood chain. The bioaccumulation factor (BAF) is the ratio of the internal concentrations from long-term exposures (febt studies or laboratory studies) to the amount of a substance taken up by an organism from the water, the diet and inhalation

For metals, bloaccumulation depends on the metal's chemical form and the properties of the surrounding medium. Metals in the aquatic environment are bloaccumulated by organisms either passively from water to fissue or by fadilitated uptake through, for instance, ion pumps that also transport major lors such as Ca.

#### Derivation of the bioaccumulation factor (BAF) for mol/odenum

Literature data, containing BAF or BCF values for molybdenum, were identified and evaluated according to the criteria of Klimisch et al (1997). IMOA commissioned a sampling study to assess the BAF in aquatic organisms exposed to regulatory relevant molybdenum concentrators. Both a field and laboratory study were conducted with molybdenum concentrations between 1.0 mg/L and 12.7 mg/L (=PNEC) technology.

#### Bioaccumulation in AQUATOX



### **FRESHWATER**

### MARINE

### **BIOACCUMULATION**



### **Coming soon: Fact Sheets**

#### **DRAFT Fact Sheet:** Terrestrial Risk Assessment of Molybdenum



#### Introduction:

According to the REACH-regulation (R10), the terrestrial effect assessment is restricted to non-vertebrate organisms living the majority of their lifetime within the soil and being exposed to Mo via the soil pathway. The use of the statistical extrapolation method is preferred for PNEC derivation.

If no hazard information is available for the soil compartment, the equilibrium partitoring method (EPM) can be applied to aquatic data to derive a PNECsoll.

#### Derivation of the Predicted No Effect Concentration (PNEC) for molybdenum

In the open literature, some relevant studies were identified with toxidity data for plants and micro-omanisms, but none of these contained reliable twicity data useful for PNEOsoli derivation. Therefore, the PNEC will only be based on the results from a research project.

IMOA commissioned a soil project, with a total of 10 topsoils and contrasting properties, after spiking the soil with NayMoO, (5 plant assays, 3 invertebrate assays and 3 microbial assays). Additionally, 3 sols were aged outdoors after spiking with sodium molybdate.

The total number of 113 dose-response curves yielded in total 82 useful EC10 and 4 NOEC values. All data were based on added mg Mo/kg dw soll.



lungary, Sgain, Sweden, The

Velherlands, United Kingdom



Toxicity of Mo was tested in 10 soils collected throughout Europe. The uncontaminated sols have contrasting properties, characteristics and features:

- 0.6-30.7% organic carbon
- 2-59% day (expressed as % of mineral sol.)
- constituents)
- 0.1-15.3 g/kg oxalate extractable iron
- Mo-background <1-3 mg/kg</li>

Soil type diversity: 6 major soil groupings (Cambisd, Chemozem, Histosol, Luvisol, Podzol, Regosol) Land use range: 7 arable solls, 3 non-arable (2 grassland and 1 orchard) solls.

#### DRAFT Fact Sheet: Molybdenum Monitoring data



The speciation forms of molybdenum that are present under environmental relevant conditions are a non-hazardous substance for the environment, thus an exposure assessment is formally not required. Regional exposure monitoring data, however, can be relevant within the environmental hazard assessment. This fact sheet presents a detailed overview of both background and ambient molybdenum concentrations in the environment (water, sediment, soil).



The concentration of No and other elements in the environment can be affected by a large number of processes. For molybdenum, these processes are related to:

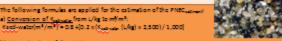
- The natural and/or anthropogenic amount of molybdenum released in the environment;
- The spatial and temporal distributions of these releases;
- The large number of transportation and transformation processes in water, air and soil.

Ambient montoring data integrates both the natural background and the concentration added by anthropogenic activities. Because the amount released by human activities is the subject of the risk assessment, it is preferred to make a distinction between the natural (background) and anthropogenic fractions in the exposure assessment. Dissolved concentrations instead of total No concentrations should preferably be used, as they are a better indicator of metal toxicity in the aquatic environment.

#### DRAFT Fact Sheet: Risk Assessment of Molybdenum in sediment and STP



The ECHA guidance on PNEC-derivation allows the derivation of a PNEC for the sediment. compertment by using test results obtained with sediment organisms, or by using a equilibrium partitioning method (57M). The latter method can be used when only data for aquatic polarie organisms are available (SCHA, 2008).



b) Determination of the PNBC<sub>outland</sub>s PNBC<sub>outlands</sub> = (6<sub>000-outla</sub>/ 8HO<sub>out</sub>) × PNBC<sub>outlands</sub> × 1,000 × 2.6 (conveniente de with PNSC<sub>equilia</sub> expressed as mg/L, RHO<sub>est</sub> = 1,500 kg/m<sup>2</sup> and the K<sub>enthelle</sub> expressed as m<sup>2</sup>/m<sup>2</sup>

The estimation of the PNSC<sub>ortens</sub>; by SPM is based on the assumption that the sersitivity of pelagic and addiment living organisms is comparable, but that in addiment the availability of the substance is reduced due to scription to the (organic matter of the) sediment. For highly adsorbing chemicals, the uptake via other exposure pathways like ingestion or direct contact with sediment becomes more important, depending on the organism used for testing. Sased on its physicochomical properties. molybdonum cannot be estegorised as such a compound, and there is no need to apply an additional safety factor on a PNEC that is derived with the EPM.

It should be taken into account that 87M may result both in an exercitimation or underestimation of the toxicity to benthic organisms (Di Toro et al. 2005). Therefore, this method can only be used as rough screening for assessing the level of risk to sediment dwelling organisms.

#### Proshwetor addiment

For Mo, no reliable scute or dirente texicity data for the freshwater sediment compartment were identified in the literature. It was therefore decided to derive a 87M-based PNSC winest using the PNEC appets and the Kondiment as a starting point.

Data used for the derivation PNECsation	
Input data	
PNECasarie	12.7 mg Ma/L
Kp (L/kg)	1,779 L/kg
RHOwe	1,200 kg/m <sup>2</sup>
Output data	
Derived Kp (m <sup>3</sup> /m <sup>3</sup> )	999.9 m³/m²
PNEGuerran	9.69 g Mo/kg
PNECastron do	22.5 g Ma/kg

**TERRESTRIAL** 

MONITORING DATA

**SEDIMENT & STP** 



### Dataset used when dialoguing with US regulatory authorities:

- Candidate Contaminant List 3 (US Drinking Water)
- Pennsylvania: water quality setting standards

### Dataset enhancement continues with further research:

- 2 aquatic studies underway so that dataset is fully useable for deriving Final Chronic Values as per US-EPA methodology
- 2011: 90-day Oral Repeated Dose Toxicity Study in rats (OECD 408 + some 416)
- 2012: Prenatal Developmental Toxicity Study in rats (OECD 414)



# 90-day Repeated Dose Toxicity and Prenatal Developmental Toxicity Studies:

Existing studies, of questionable quality (Pandey & Singh 2002, and Fungwe 1990) reported findings

2011/2012: OECD guide-line conforming, GLP laboratory studies commissioned by IMOA to HLS (New Jersey) and RTI (North Carolina)

HLS and RTI studies could not replicate findings of earlier studies, even at significantly higher doses

Will seek to publish in peer-reviewed journals during 2013/early 2014



### **US-EPAIRIS** Database:

Reference Dose for molybdenum: 0.005 mg/kg/day

Value was set way back in 1993

Given the much enhanced dataset available now in 2013 it would be

timely to re-examine the basis for the Mo RfD.

IMOA stands ready to contribute!



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**REACH** disseminated dossiers:

http://echa.europa.eu/web/guest/information-on-chemicals/registeredsubstances

### **THANK YOU**