

15 June 2011

Draft background document for cobalt(II) carbonate

Document developed in the context of ECHA's third Recommendation for the inclusion of substances in Annex XIV

Information comprising confidential comments submitted during public consultation, or relating to content of Registration dossiers which is of such nature that it may potentially harm the commercial interest of companies if it was disclosed, is provided in a confidential annex to this document.

1. Identity of the substance

Chemical name: Cobalt(II) carbonate
EC Number: 208-169-4
CAS Number: 513-79-1

This background document covers also the hydrated forms of Cobalt(II) carbonate.

2. Background information

2.1. Intrinsic properties

Cobalt(II) carbonate was identified as a Substance of Very High Concern (SVHC) according to Articles 57(a) and (c) as it is classified according to Annex VI, part 3, Table 3.1 of Regulation (EC) No 1272/2008 as a carcinogen category 1B¹, H350i (may cause cancer by inhalation), and as toxic for reproduction category 1B¹, H360F (may damage fertility), and was therefore included in the candidate list for authorisation on 15 December 2010, following ECHA's decision ED/95/2010.

2.2. Imports, exports, manufacture and uses

2.2.1. Volume(s), imports/exports

According to registration information the volume manufactured / imported in the EU is in the range of **1,000 – 10,000 t/y**. On the basis of tonnages reported to the Cobalt REACH Consortium (CoRC; RCOM, 2010; personal communication with EUROMETAUX, 2011), the annual production in the EU, corrected for export, was estimated in the same range.

¹ Classification in accordance with Regulation (EC) No 1272/2008 Annex VI, part 3, Table 3.1 List of harmonised classification and labelling of hazardous substances as amended and adapted to technical and scientific progress by Commission Regulation (EC) No 790/2009, OJ No L 235, p. 1, 5.9.2009

2.2.2. *Manufacture and uses*

2.2.2.1. Manufacture and releases from manufacture

Cobalt(II) carbonate is prepared by adding a hot solution of cobalt salts to a hot sodium carbonate or sodium bicarbonate solution. Precipitation from cold solutions gives a light blue unstable product. Dissolution of cobalt metal in ammonium carbonate solution followed by thermal decomposition of the solution gives a relatively dense carbonate (HSDB 2010) (Kirk-Othmer in the Netherlands, 2010).

At a study mentioned in the Annex XV dossier, measured cobalt concentrations at workplaces with exposure to cobalt salts in a refinery were 68 – 89 µg/m³ (range 1 – 7700 µg/m³) (Lison 1994 in the Netherlands, 2010).

The Cobalt REACH Consortium reported that manufacture and/or import facilities of the Cobalt REACH Consortia members for cobalt(II) carbonate are located in Belgium, Finland, Germany, Norway, and the UK (the Netherlands, 2010).

2.2.2.2. Uses and releases from uses

Uses

According to Registration data (additional info from other sources as mentioned below), cobalt(II) carbonate is used in the EU in:

- ***Manufacture of other chemicals;***

This includes also use in ***other wet chemical processes***. According to the Cobalt Development Institute (CDI), and other comments received during stakeholder consultation, cobalt(II) carbonate is also used in the manufacture of ***catalysts*** (hydrotreating; oxidation catalyst; hydrodesulphurisation; Fischer Tropsch (GTL); The Netherlands, 2010; RCOM, 2010; personal communication with EUROMETAUX, 2011).

- ***Surface treatment processes:***

- *Electrodeposition* (the Netherlands, 2010; RCOM, 2010): cobalt salts (not necessarily all the described applications below are relevant for cobalt(II) carbonate) are electroplated as Co metal or alloys with nickel, tungsten, iron, molybdenum, chromium, zinc, and precious metals. Applications include aerospace-, automotive-, telecommunication-, electronics-, storage media-, military-, etc.-industries. The function of the substance is to affect physical properties of surfaces, e.g. smoothness, hardness, brightness, ductility, resistance, porosity, or the production of record and compact discs.
- *Colour anodizing*
- *Non-electrodeposition*
- *Welding and soldering processes*

- *Calcination/sintering process in the context of the manufacture/production of inorganic pigments & frits, glass, ceramic ware (in these cases: use as colorant or for discolouring), varistors and magnets:*

Although the use of cobalt(II) carbonate in the production of inorganic pigments and frits has been registered, the Cobalt REACH Consortium (CoRC) has commented, on the basis of information from the Inorganic Pigments Consortium, that other cobalt substances are used in the manufacture of frits and pigments. It is though additionally mentioned that some references of cobalt carbonate used as pigment for decorating porcelain and clays exist (personal communication with EUROMETAUX).

In ceramics, frits (glazes, enamels) and glass, cobalt salts (not clear if relevant also for cobalt(II) carbonate) are used as a colorant or a decolourant in the production process. Decolourising is assumed to be due to the catalytic effect of small amounts of Co(II) on bleaching actually performed by other oxidative substances (see e.g. Zhang et al., 1998, on a different application with similar function of Co²⁺).

Cobalt salts are used in ceramic pigments and designated as underglaze stains, glaze stains, body stains, overglaze colours, and ceramic colours. The underglaze is applied to the surface of the article prior to glazing. The glaze stain uses cobalt colorants in the glaze. A body stain is mixed throughout the body of the ceramic. Overglaze colours are applied to the surface and fired at low temperatures. Ceramic colours are pigments used in a fusible glass or enamel and are one of the more common sources of the blue coloration in ceramics, china, and enamel ware (the Netherlands, 2010). Cobalt salts are also possibly used as bleaching agent in sanitary ceramics².

Cobalt has been detected with a concentration of 560 mg/kg in one out of 12 glass and ceramic colours for hobby use (Danish Environmental Agency, 2005: Survey and assessments of chemical substances in glass and porcelain colours. Survey of chemical substances in consumer products No. 59; In RCOM, 2010).

Varistors are used for search protection in electrical and electronic products e.g. computers, office equipment, video and audio recording, communication equipment. No information has been provided regarding the exact function(s) of cobalt salts in the production of varistors and magnets (this is assumed to relate mainly to the magnetic properties of cobalt oxide).

- *As a catalyst:*

Although this use has been registered as identified use, information provided by the industry suggests that rather other catalysts are manufactured from cobalt(II) carbonate, and that this is in fact a use as intermediate (RCOM, 2010; personal communication with EUROMETAUX, 2011). According to CoRC, the use of cobalt(II) carbonate as such as catalyst is unlikely (RCOM, 2010).

- *Fertilisers*

² Sanitary ceramics comprise wash-bowls, glass bowls, baths, water massage baths, WC, bidets, seats, mixers, bathroom accessories, heating units, etc.

- ***Animal food supplement (“feed grade materials”)***

Information on further (to the above listed) uses was not possible to confirm on the basis of the available data. It is noted that cobalt has been detected in cosmetic kohl products (concentrations between 0.11 and 51 mg/kg) and in cosmetic henna products (concentrations between 0.59 and 1.1 mg/kg) (Danish Environmental Agency, 2005: Survey of chemical substances in consumer products No. 65; In RCOM, 2010).

Volumes per sector or use

According to information collected by the Cobalt REACH Consortium (the Netherlands, 2010; RCOM, 2010; personal communication with EUROMETAUX, 2011³):

- more than 80% of the cobalt(II) carbonate in the EU is used in the manufacture of catalysts,
- up to 15% is used in animal food supplement
- less than 2% is used in the manufacture of chemicals (feed materials for other chemicals),
- less than 2% is used in the manufacture of pigments (ceramic, glass) and adhesives (ground coat frit)

Releases from uses

The main route of occupational exposure of cobalt compounds is via the respiratory tract by inhalation of dusts, fumes and mists containing cobalt (IARC 1991 in RCOM, 2010). According to its classification, Cobalt(II) carbonate may cause cancer by inhalation, with a low specific concentration limit of 0.01% for this hazard (it is noted that cobalt(II) carbonate is also classified as toxic for reproduction).

Some measured concentrations have been reported in the literature for the dust in facilities producing cobalt salts (0.05–50 mg cobalt /m³), and in a refinery (relating to cobalt salts use - 68 – 89 µg/m³; range 1 – 7700 µg/m³) (the Netherlands, 2010; RCOM, 2010).

The Cobalt REACH Consortium highlighted during the public consultation on the identification of the substance as SVHC that further exposure data is available, as having been provided to the Consortium Consultants, and which were considered in the detailed Exposure Scenarios that were prepared for the Registration Dossiers of cobalt salts. According to Germany, on the basis of toxicological and exposure data in the open literature the occupational cancer risk is expected to be high (ROCM, 2010).

As regards consumer exposure, in a relevant study on porcelain dinnerware from Europe and Asia, which had been manufactured before mid-1970s and had hand-painted designs over the glaze, the extracted Co under acidic conditions was from <0.020 to 2.9 µg/mL (Sheets 1998 and ASTDR 2004 in the Netherlands, 2010).

³ Some use categories have been combined for reasons of commercial confidentiality.

All the above uses have been listed in the registration dossiers as industrial, apart from the professional use of granular fertilisers / feed grade materials.

2.2.2.3. Geographical distribution and conclusions in terms of (organisation and communication in) supply chains

Estimates on the number of downstream users of cobalt(II) carbonate in the EU have been provided for combined use categories by the Cobalt REACH Consortium (CoRC; the Netherlands, 2010). According to these data (some double-counting may exist, according to CoRC), approx. 10–15 downstream users relate to the manufacture of catalysts, 20-30 users are involved in animal food supplement, 10–15 in the production of pigments and adhesion, and less than 5 sites are estimated to involve in the production of other chemicals.

Therefore, based on the available information and the registered uses, it can be concluded, in particular for uses in the scope of authorisation, that the supply chains contain a relatively small number of EU manufacturers and importers, a medium number of downstream user sites (and potentially a higher number of professional users), which represent a medium number of industry branches. In conclusion, according to the available information, the supply chains for cobalt(II) carbonate appear to be of medium complexity.

2.3. Availability of information on alternatives⁴

As for cobalt(II) carbonate and other cobalt salts a number of common uses have been registered, it can be reasonably assumed that such salts could in general replace cobalt(II) carbonate in some of its applications.

According to the Cobalt REACH Consortium, the vast majority of the applications do actually not allow for mutual substitution of the cobalt salts for technical and/or economical reasons; even where it is chemically feasible to substitute the cobalt salts, it would not be practical on an industrial scale without involving excessive cost (further information is currently collected for the current applications; personal communication with EUROMETAUX, 2011).

According to industry comments (RCOM, 2010), no suitable alternatives have been identified for cobalt(II) carbonate.

2.4. Existing specific Community legislation relevant for possible exemption

No data available.

⁴ Please note that this information was not used for the prioritisation.

2.5. Any other relevant information (e.g. for priority setting)

No data available.

3. Conclusions and justification

3.1. Prioritisation

Verbal-argumentative approach

Relatively low volume used in the scope of authorisation. It appears that the substance is used at a medium number of industrial settings and by professionals.

Releases at workplaces in industrial settings seem to be controlled in most cases but some processes, involving handling of powder forms of the substance have a potentially significant exposure potential for industrial and - where relevant - professional workers. Environmental releases from fertilisers may be low but possibly widespread.

Therefore, based on the criteria, the substance has moderate priority.

Scoring approach

Score			Total Score
Inherent properties (IP)	Volume (V)	Uses - wide dispersiveness (WDU)	(= IP + V + WDU)
Score: 0 - 1 ⁵ (carcinogen 1B; toxic for reproduction 1B)	3 (Relatively low volume in the scope of authorisation)	Overall score: 2 * 3 = 6 Site-#: 2 (Used at a presumably medium number of sites) Release: 3 (for some uses risk of significant and potentially uncontrolled exposure)	9 - 10

Conclusion, taking regulatory effectiveness considerations into account

On the basis of the prioritisation criteria, cobalt(II) carbonate has moderate priority for inclusion in Annex XIV.

As there are other cobalt(II) compounds on the Candidate List that could replace the substance in at least some of its uses, these other cobalt(II) compounds should be grouped with the substance and included in Annex XIV as well.

⁵ Some information has been provided by the Cobalt REACH Consortium regarding a potential concentration threshold of cobalt (II) salts for eliciting cancer effects. For the sole purpose of this prioritisation step a score in the range 0 (carcinogenic with threshold) - 1 (carcinogenic without threshold) is assigned. This scoring does not pre-empt any conclusion by the Risk Assessment Committee when preparing its opinions on the future applications.

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Therefore, **it is proposed to recommend cobalt(II) carbonate for inclusion in Annex XIV.**

4. References

The Netherlands (2010): Annex XV dossier for the proposal for identification of Cobalt(II) carbonate as a CMR CAT 1 or 2, PBT, vPvB or a substance of an equivalent level of concern. Submitted by the Netherlands. http://echa.europa.eu/doc/consultations/svhc/svhc_axvrep_netherlands_cmr_co-carbonate.pdf

Personal communication with EUROMETAUX (2011): Comments provided by the Cobalt REACH Consortium on clarification of information regarding the prioritisation of the cobalt salts

RCOM (2010): "Responses to comments" document compiled from the commenting period on the identification of Cobalt(II) carbonate as SVHC (08.03.-22.04.2010). http://echa.europa.eu/doc/about/organisation/msc/msc_rcoms2010/rcom_cobaltcarbonate/rcom_cobaltcarbonate_20101119.rtf