17 December 2010

Background document for lead chromate

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

1. Identity of the substance

Chemical name:	Lead chromate
EC Numbers:	231-846-0
CAS Numbers:	7758-97-6[1]
IUPAC Name:	Lead (2+) chromate

2. Background information

2.1. Intrinsic properties

Lead chromate was identified as a Substance of Very High Concern (SVHC) according to Article 57(a) and (c) as it is classified according to Annex VI, part 3, Table 3.2 of Regulation (EC) No 1272/2008 as a carcinogen category 2, R45 (may cause cancer), and as toxic to reproduction category 1, R61 (may cause harm to the unborn child)[2], and was therefore included in the candidate list for authorisation on 13 January 2010, following ECHA's decision ED/68/2009.

2.2. Imports, exports, manufacture and uses

2.2.1. Volume(s), imports/exports

Production

In Slovenia, 111 t of lead chromate were manufactured in 2007, with the volume having steadily increased since 2002, but declined to 51t in 2008 (Technical report, 2010). Consultations with French pigments manufacturers indicate that there is no manufacturing of lead chromate in France anymore. No additional information through literature search has been found regarding manufacture at European level (Annex XV Dossier (2009)), nor via further consultation.

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[1] (Deleted CAS numbers: 8049-64-7, 181768-98-9)

[2] This corresponds to a classification as carcinogen 1B, H350 (may cause cancer) and as toxic to reproduction 1A, H 360D (may damage the unborn child) in Annex VI, part 3, Table 3.1 of Regulation (EC) No 1272/2008 (List of harmonised classification and labelling of hazardous substances).

Import
According to information submitted by one non-EU company, lead chromate is exported to the EU in the form of a pigment in fairly substantial quantities, which are in the range of 100 – 1,000 t/y (confidential information). The company confirmed that the exported substance is lead chromate and not lead sulfochromate yellow or lead chromate molybdate sulphate red. 29 t of lead chromate were imported to Slovenia in 2009, while this tonnage was much lower in the previous years (<5 t). Import of occasional very low amounts of crocoite (few kg per year and not every year), for distribution in the art conservation field, was reported by one company (Technical report, 2010).

Consumption
Data on **consumption** of lead chromate is available for some countries in Europe, with the respective volumes summing up to less than 60 tonnes per year. In more detail, consumption of pure lead chromate in France was estimated by INRS (Institut National de Recherche et de Sécurité) as a volume of about 50 tonnes in 2005 (INRS, 2005). In Sweden, the use of lead chromate has fallen sharply from 76 tonnes in 1992 to 3.5 tonnes in 2004. 4 tonnes of lead chromate were used in Slovenia in 2009 (Technical report, 2010), in comparison with 11t in 2007 (Annex XV Dossier (2009)).

In 2007, the total use of lead chromate in mixtures was about 2 tons for both Denmark and Sweden. No data was available in the database for Finland and Norway for the year 2007 (Annex XV Dossier (2009)). Amounts of lead chromate in mixtures summing to less than 1t were reported by Slovenia (Technical report, 2010).

On the basis of a survey conducted by CEPE[3], the use of lead chromate *in paints* is roughly estimated to exceed 100 tons/year (extrapolation from data collected by 30 companies). CEPE suggests though that these figures should be checked with the European Association of Pigment Manufacturers (RCOM).

On the other hand, according to information received from a manufacturer of lead pigments (personal communication with industry, 2010), lead chromate is not on the market except small amounts for use in research and development.

2.2.2. Manufacture and uses

2.2.2.1. Manufacture and releases from manufacture

Manufacture process (Annex XV Dossier (2009))
Lead chromate occurs in nature as crocoite, an orange-red mineral. Lead chromate can be produced by a reaction of sodium chromate with lead nitrate, or of lead monoxide with chromic acid solution. Details of various commercial procedures for lead chromate are generally not revealed by producers.

Pure lead chromate is usually prepared by the addition of a sodium dichromate solution to a solution of lead salt or a suspension of a less soluble lead compound. The

[3] European Council of producers and importers of paints, printing inks and artists' colours. CEPE represents the interest of approximately 1000 members in the European Union, Norway and Switzerland

colour varies from green-yellow to yellow-red depending on the proportions of each constituent and on the crystal form.

Manufacture sites and releases from manufacture
As mentioned above, not much information is available on the manufacture of lead chromate in EU. Due to closeness between the manufacture process for lead chromate and the lead chromate pigments (C.I. Pigment Yellow 34 & C.I. Pigment Red 104), it is probable that manufacture takes place at the same sites.

2.2.2.2. Uses and releases from uses

Uses
According to the European colorants industry (Eurocolour), the pure lead chromate was never of technical importance and only the two lead chromate pigments (C.I. Pigment Yellow 34 and Red 104) have been used commercially since several decades (Annex XV Dossier (2009)). Eurocolor has confirmed that members of the European Manufacturers of Lead Chromate and Lead Molybdate Pigments (EMLC) do not market lead chromate (Technical report, 2010). According to information provided by a non-EU manufacturer of pigments, lead chromate is not used as a pigment due to its poor colour stability. It may however often be confused with lead sulfochromate yellow (Industry, 2010).

On the other hand, information provided by a different non-EU manufacturer of lead chromate pigments suggests that lead chromate can be stabilised, and whilst not completely encapsulated, it undergoes limited treatment with silica. This allows the substance to be imported in the EU and be used as a pigment. Information collected from other sources further supports the view that lead chromate may still find use in the EU, albeit limited, especially when compared to the other two lead chromate pigments (Technical report, 2010).

Lead chromate is used in the **manufacture of paints and varnishes**. Applications relate to products requiring protection against corrosion or bright colours with a good resistance (Annex XV Dossier, 2009). Confirmed areas of application include vehicles, farming material, boat/ships, industrial paint products, civil engineering material, road sign and road painting (RCOM, Annex XV Dossier, 2009), as well as quick dry enamels and floor paints (Technical report, 2010). It is not clear whether confirmed uses such as in car touch-up paints are carried out (also) by professionals.

Lead chromate was also confirmed to be used in the **manufacture of art conservation colours** (potentially used in the conservation of historic objects of art and/or as reference material), **leather finishing mixtures**, in the **manufacture of plastic masterbatches** and **finished plastics**, as well as in the **manufacture of pyrotechnics** (Technical report, 2010). The latter may include pyrotechnic delay compositions for ammunition, ignition compositions for ammunition, and delay detonators for the mining and demolition sectors (Technical report, 2010)**.**

Further potential uses of lead chromate could not be confirmed:

- *Manufacture of other pigments*: one non-EU manufacturer of lead pigments suggests that there is a possibility that lead chromate is produced or imported

into the EU for the purpose of manufacturing C.I. Pigment Yellow 34 or C.I. Pigment Red 104 (Technical report, 2010).

- *Use in detergents*: referenced in the literature and reported by INRS (Annex XV dossier, Technical report, 2010), but considered by the International Associations for Soaps, Detergents and Maintenance Products as wrongly reported, phased out, or potentially a "niche" use, not known to its members (Technical report, 2010).
- *Use in embalming products*: although theoretically it can be used in spray skin restorative products and green cosmetic powder, actual use is quite unlikely; no embalmer in EU uses products containing lead chromate and there are plenty of lead chromate-free alternatives (European Association of Embalmers in Technical report, 2010).
- *Use in tattoo inks* (OKBI, 2006): many references in the literature; nevertheless, according to the Tattoo Ink Manufacturers of Europe, lead chromate is not used in tattoo and permanent make-up inks worldwide; no EU-company was identified supplying lead chromate containing tattoo inks (Technical report, 2010).
- *Use in photosensitive materials*: lack of information; literature refers to use in reprographic agents and photography chemicals.
- Other uses, such as in *printing fabrics*, *rubber* (though industrial paint for marking on rubber was confirmed), *and decorating porcelain* (RCOM; lack of data), as well as in *analytical chemistry* (Technical report, 2010).

As mentioned above, the use of lead chromate **in paints** is roughly estimated to exceed 100 tons/year. An additional volume in the range of 100 – 1,000 t was reported by one non-EU company to be sold to **masterbatch producers** in the EU. According to volumes provided during the consultation, the amounts used in **art conservation colours** should be negligible (kilograms/y), while in **pyrotechnics** volumes available from 3 companies sum up to less than 10 t/y. No information was provided on the amount of lead chromate used in other confirmed applications (Technical report, 2010).

Information collected suggests that the use of lead chromate in paints may be in decline. No specific information is available for other uses of lead chromate, although it is understood that a reasonable demand for these products (although associated with small volumes) from the conservation art community should be envisaged to remain in the future. Furthermore, consumption patterns in the manufacture of pyrotechnics generally depend on customer demand, with some of the involved users to be in the process of investigating alternatives (Technical report, 2010).

Releases from uses

Releases to the working environment and consumers

Information is available regarding releases / exposure during painting applications, as well as during manufacture and use of pyrotechnics / explosives (Technical report, 2010).

Some paint applications may take place without any specific exposure control measures. Furthermore, vehicle refinishing and body work products may expose the

public to lead chromate; however the classification of this substance should prevent it from being used in such products (NICNAS - National Industrial Chemicals Notification and Assessment Scheme - 2007 in Technical report, 2010).

A company that uses lead chromate in the manufacture of pyrotechnic mixtures for ignition and delay compositions provided measurements data on negligible workers' exposure during manufacture of pyrotechnic mixtures. Furthermore, a set of personal protection equipment used and medical control of employees were mentioned by the relevant industry.

According to the German Federal Institute for Materials Research and Testing, use (firing) of ammunition will theoretically release combustion products of the pyrotechnic mixture (lead (II) oxide and chromium (III) oxide), but the exposure is expected to be low due to the very low lead chromate content of ammunition (Technical report, 2010).

Releases to the environment
A company manufacturing small quantities of art conservation paints indicated no releases to air water or soil and only a very small loss (0.1 kg/y) to waste, which is separated as toxic waste (Technical report, 2010).

During the manufacture of pyrotechnics, one company argued that the entire amount is consumed in the manufacture process, with any waste generated being combusted, and the solid combustion products managed by specialized companies as toxic waste. Waste in the form of contaminated packaging and samples for analysis are types of lead-chromate-containing-waste that can be produced in such manufacturing activities according to another company (Technical report, 2010). Operational uses of pyrotechnics containing lead chromate may only lead to releases of combustion products to air and soil during the combustion of the pyrotechnic composition. No quantitative data were provided during the consultation (Technical report, 2010).

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

Generally, the number of suppliers of lead chromate to the paint making industry may be small but the number of users of these paints could be substantial. As for paints for conservation purposes, a single manufacturer has indicated that these may be sold to 300 customers across the EU, while crocoite as a reference material may be supplied to 200 customers. Nonetheless, the amount sold per customer in the latter case is only a few grams per year. The nature of the use in masterbatches would suggest that while a small number of suppliers of lead chromate may supply this to a modest number of masterbatch suppliers, the number of plastics manufacturers who use this product may be particularly large and spread across the EU (Technical report, 2010).

Available information shows that manufacture, import, and uses of lead chromate on its own or in mixtures takes place in several countries in the EU, while it is envisaged that downstream users are widespread in the EU (Technical report, 2010).

Summarizing, the supply chains appears to contain a modest number of EU manufacturers and importers and a high number of downstream users. The industry branches involved seem to produce a relatively large number of different products. In conclusion, according to the available information, the supply chains for lead chromate are rather complex.

2.3. Availability of information on alternatives[4]

No data available.

2.4. Existing specific Community legislation relevant for possible exemption

No data available.

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

No data available.

3. Conclusions and justification

3.1. Prioritisation

The annually consumed volume in the EU is relatively high. Uncontrolled exposure of professionals may occur in applications including, for example, painting, restoration and pyrotechnics. Furthermore, releases to the environment may occur especially after the end of the service life of articles (coated articles, plastics). The uses of the substance are widespread to wide dispersive.

Verbal-argumentative approach

On the basis of the prioritisation criteria the substance qualifies for prioritisation.

Scoring approach

Score			Total Score
Inherent properties (IP)	Volume (V)	Uses - wide dispersiveness (WDU)	(= IP + V + WDU)
1 Carcinogen, cat. 2; Toxic to reproduction, cat. 1	5 (Relatively high volume (range 100 – 1000 t/yr) used in EU)	Overall score: 3 * 3 = 9 Site-#: 3 (Use at a high # of sites) Release: 3 (At least for some uses such as in paints and restoration uncontrolled exposure of professionals as well as consumers cannot be excluded)	15

Conclusion, taking regulatory effectiveness considerations into account

On the basis of the prioritisation criteria the substance qualifies for prioritisation.

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

Considering regulatory effectiveness, it further cannot be excluded on the basis of current knowledge that the substance could be used to replace lead sulfochromate yellow (C.I. Pigment Yellow 34) in some of its uses.

Therefore, it is suggested to prioritise lead chromate for inclusion in Annex XIV.

4. References

Annex XV Dossier (2009): Annex XV dossier for the proposal for identification of Lead chromate as a CMR CAT 1 or 2, PBT, vPvB or a substance of an equivalent level of concern. Submitted by France. http://echa.europa.eu/doc/consultations/svhc/svhc_axvrep_france_cmr_lead_chromate_20090831.pdf

Industry (2010): Personal communication with industry (meeting on May 5, 2010).

OKBI (2006): Tattoos, tattoo inks ("TETOVÁLÁS, TETOVÁLÓSZEREK"); Leaflet by the National Institute of Chemical Safety, Hungary (Országos Kémiai Biztonsági Intézet).

RCOM: "Responses to comments" document compiled from the commenting period on the identification of Lead chromate as SVHC (31.08-15.10.2009).

Technical report (2010): Data on the European Market, Uses and Releases/Exposures for Lead Chromate prepared for ECHA by DHI in co-operation with Risk & Policy Analysts Limited and TNO (Contract ECHA/2008/2/SR25), 11 June 2010.