To: McClintock, Katie[McClintock.Katie@epa.gov]
From: Smith, Judy
Sent: Sat 2/27/2016 12:18:05 AM
Subject: FW: Metals Release - Media Monitoring Report 02.26.16
removed.txt
Media Monitoring Report Metal Release 02.26.2016.docx

Sorry I didn't get this filed. Here is the report for today.

From: BLACK Julie [mailto:julie.black@state.or.us]
Sent: Friday, February 26, 2016 12:38 PM
Subject: Metals Release - Media Monitoring Report 02.26.16

The media monitoring report for the previous 24 hours is attached.

Julie Black, Ed.M.

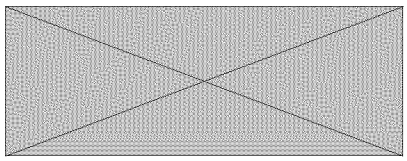
All Hazards Planner

Public Health Division

julie.black@state.or.us

Office# 971-673-0706

Cell# 971-888-3358



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To: McClintock, Katie[McClintock.Katie@epa.gov]
From: PALERMO Jaclyn
Sent: Fri 2/26/2016 11:37:10 PM
Subject: the library research
Hexavalent_Chromium_Brief.docx
Hexavalent_Chromium_Citations_References.docx
Cadmium_Brief.docx
Cadmium_Citations_References.docx

Katie,

I attached the research the State Library did. A disclaimer: I have not had a chance to sort through it so I am not sure how useful it is yet. Mostly abstracts it looks like.

Thanks,

Jaclyn

Database: SCOPUS

Search: Glass AND Hexavalent Chromium

Abstracts Only

Recommended Documents on Scopus

Sent to you by: jerry.w.curry@state.or.us

I thought you would find these documents on Scopus useful.

Documents

Dhal, B.[a] , Thatoi, H.N.[b] , Das, N.N.[c] , Pandey, B.D.[a]

Chemical and microbial remediation of hexavalent chromium from contaminated soil and mining/metallurgical solid waste: A review

(2013) *Journal of Hazardous Materials*, 250-251, pp. 272-291. Cited 73 times.

DOI: 10.1016/j.jhazmat.2013.01.048

[a] Metal Extraction and Forming Division, CSIR-National Metallurgical Laboratory, Jamshedpur 831 007, Jharkhand, India
[b] Department of Biotechnology, College of Engineering and Technology, Bhubaneswar 751 003, Orissa, India
[c] Department of Chemistry, North Orissa University, Baripada 757 003, Orissa, India

Abstract
Chromium is a highly toxic non-essential metal for microorganisms and plants, and its occurrence is rare in nature. Lower to higher chromium containing effluents and solid wastes released by activities such as mining, metal plating, wood preservation, ink manufacture, dyes, pigments, glass and ceramics, tanning and textile industries, and corrosion inhibitors in cooling water, induce pollution and may cause major health hazards. Besides, natural processes (weathering and biochemical) also contribute to the mobility of chromium which enters in to the soil affecting the plant growth and metabolic functions of the living species. Generally, chemical processes are used for Cr- remediation. However, with the inference derived from the diverse Cr-resistance mechanism displayed by microorganisms and the plants including biosorption, diminished accumulation, precipitation, reduction of Cr(VI) to Cr(III), and chromate efflux, bioremediation is emerging as a potential tool to address the problem of Cr(VI) pollution. This review focuses on the chemistry of chromium, its use, and toxicity and mobility in soil, while assessing its concentration in effluents/wastes which becomes the source of pollution. In order to conserve the environment and resources, the chemical/biological remediation processes for Cr(VI) and their efficiency have been summarised in some detail. The interaction of chromium with various microbial/bacterial strains isolated and their reduction capacity towards Cr(VI) are also discussed. © 2013 Elsevier B.V..

Author Keywords
Bioremediation; Chromium toxicity; Cr(VI) contaminated soil; Cr(VI) reduction; Cr(VI) resistance

Document Type: Review
Source: Scopus

Berg, T.L.[a] , Davis, C.E.[b]
Chromium VI: Concerns, compliance and controls
(2008) *Ceramic Engineering and Science Proceedings*, 29 (1), pp. 221-228.

[a] CertainTeed Corporation, Blue Bell, PA, United States
[b] CertainTeed Corporation, Kansas City, KS, United States

Abstract
It has been determined that airborne particles of hexavalent Chromium, Cr +6, pose a number of possible health threats, of which, both employers and employees need to be made aware. Understanding and implementing OSHA STANDARD 29CFR-1910.1026 and its supporting documentation will provide protection for your employees, contractors and the community-at-large. This paper is presented by permission of Saint Gobain Corporation, Valley Forge, PA.

Document Type: Conference Paper
Source: Scopus

Blade, L.M.[a d] , Yencken, M.S.[b] , Wallace, M.E.[b] , Catalano, J.D.[b] , Khan, A.[a] , Topmiller, J.L.[a] , Shulman, S.A.[a] , Martinez, A.[c] , Crouch, K.G.[a] , Bennett, J.S.[a]
Hexavalent chromium exposures and exposure-control technologies in American enterprise: Results of a NIOSH field research study
(2007) *Journal of Occupational and Environmental Hygiene*, 4 (9), pp. 596-618. Cited 16 times.

DOI: 10.1080/15459620701463183

[a] National Institute for Occupational Safety and Health, Cincinnati, OH, United States
[b] Battelle Centers for Public Health Research and Evaluation, Seattle, WA, United States
[c] Los Alamos National Laboratory, Los Alamos, NM, United States
[d] CDC-NIOSH, DART-EPHB, Robert A. Taft Laboratories, 4676 Columbia Pkwy., Cincinnati, OH 45226, United States

Abstract
The National Institute for Occupational Safety and Health (NIOSH) conducted 21 field surveys in selected industries to characterize workers' exposures to hexavalent chromium-containing airborne particulate and to evaluate existing technologies for controlling these exposures. Hexavalent chromium Cr(VI) is a respiratory irritant and chronic inhalation may cause lung cancer. Primary evaluation methods included collection of full work shift, personal breathing-zone (PBZ) air samples for Cr(VI), measurement of ventilation system parameters, and documentation of processes and work practices. This study emphasized evaluation of engineering exposure control measures, so PBZ exposures were measured on the outside of personal protective equipment, for example, respirators. Field surveys were conducted in two chromium electroplating facilities, including one where full-shift PBZ exposures to Cr(VI) ranged from 3.0 to 16 times the 1 μg/m3NIOSH recommended exposure limit (REL) despite several engineering controls on the plating tanks. At a painting and coating facility that used Cr(VI)-containing products, full-shift exposures of painters and helpers (2.4 to 55 μg/m3) exceeded the REL, but LEV effectiveness was limited. Other operations evaluated included welding in construction; metal cutting operations on chromium-containing materials in ship breaking; chromate-paint removal with abrasive blasting; atomized alloy-spray coating; foundry operations; printing; and the manufacture of refractory brick, colored glass, prefabricated concrete products, and treated wood products. NIOSH researchers concluded that, in many of the evaluated processes, Cr(VI) exposures at or below the current NIOSH REL are achievable. However, for some processes, it is unclear whether controlling exposures to this range is consistently achievable without respirator use. Some operations involving the application of coatings and

finishes may be among those most difficult to control to this range. Most operations judged to be moderately difficult to control to this range involve joining and cutting metals with relatively high chromium content. Nonetheless, exposures in a wide variety of other processes were judged more easily controllable to the current REL or below, or were found to be minimal, including some operations meeting the general descriptions named above but with different specific operating parameters producing lower Cr(VI) exposures.

Author Keywords
Chromium; Engineering controls; Exposure assessment; Exposure controls; Field study; Hexavalent chromium

Document Type: Article
Source: Scopus

Samanta, G., Boring, C.B., Dasgupta, P.K.
Continuous automated measurement of hexavalent chromium in airborne particulate matter
(2001) *Analytical Chemistry*, 73 (9), pp. 2034-2040. Cited 35 times.

DOI: 10.1021/ac001337m

Department of Chemistry and Biochemistry, Texas Tech University, Lubbock, TX 79409-1061, United States

Abstract
An automated continuous instrument for the collection and measurement of aerosol Cr(VI) is described. The system alternately collects the sample on one of two glass fiber filters. After 15-min sample collection on one filter, the sampling switches over to the second filter. The freshly sampled filter is washed for 8.5 min, and the washings are preconcentrated on a minicolumn packed with anion exchange resin. The washed filter is dried with filtered hot air for the next 6.5 min so that it is ready for sampling at the end of the 15-min cycle. The preconcentrated Cr(VI) on the column is eluted with 0.1 M sodium perchlorate and then reacted with sym-1,5-diphenylcarbazide prior to absorbance detection with a light emitting diode-based dedicated flow-through absorbance detector. The detection limit (S/N = 3) is 5 ng of Cr(VI)/m3, orders of magnitude lower than current regulatory requirements. The instrument operates unattended over long periods. In continuous round-the-clock operation, filter replacement frequency is every 24-72 h, depending on dust loading. The system is portable for facile field deployment and permits fully automated rapid determinations at a very low analysis cost per sample.

Document Type: Article
Source: Scopus

Guadagnino, E.[a] , Corumluoglu, O.[b]
Recommended procedure for the determination of lead and cadmium at trace levels in glass
(2000) *Glass Technology*, 41 (4), pp. 130-134. Cited 2 times.

[a] Stazione Sperimentale del Vetro, Murano-Venezia, Italy
[b] Sisecam, Research Center, Istanbul, Turkey

Abstract
The EC Directive 94/62 on packaging and packaging waste set out the permissible concentration levels of the four heavy metals Pb, Cd, Hg and hexavalent chromium in packaging. Article 10 of the Directive encourages the development of analytical procedures for the determination of these elements and the preparation of suitable reference materials. Since 1994 Technical Committee 2 of the International Commission of Glass participated in the preparation of a trace elements reference glass containing lead and cadmium at concentrations comparable with the proposed limit values. The glass reference materials have been certified within a project conducted and financed under the Standards, Materials and Testing Programme of EU and is now available as CRM 664. This report summarizes the results obtained during the study and recommends a specific analytical procedure for the analysis of Pb and Cd in glass. The determination of mercury and hexavalent chromium, that were not included in the CRM, will be the object of future publications.

Document Type: Article
Source: Scopus

Meegoda, J.N.[a] , Kamolpornwijit, W.[b] , Vaccari, D.A.[c] , Ezeldin, A.S.[d] , Noval, B.A.[e] , Mueller, R.T.[f] , Santora, S.[g]

Remediation of chromium-contaminated soils: Bench-scale investigation

(1999) *Practice Periodical of Hazardous, Toxic, and Radioactive Waste Management*, 3 (3), pp. 124-131. Cited 23 times.

DOI: 10.1061/(ASCE)1090-025X(1999)3:3(124)

[a] Dept. of Civ. and Envir. Engrg., New Jersey Inst. of Technol., Newark, NJ 07102, United States
[b] Dept. of Civ. and Envir. Engrg., New Jersey Inst. of Technol., Newark, NJ, United States
[c] Steven Inst. of Technol., Hoboken, NJ 07030, United States
[d] Steven Inst. of Technol., Hoboken, NJ, United States
[e] Energy Products Enrichments Inc., Norristown, PA 19401, United States
[f] New Jersey Dept. of Envir. Protect., Trenton, NJ 08625, United States
[g] New Jersey Dept. of Envir. Protect., Trenton, NJ, United States

Abstract
A feasibility study was performed to remediate chromium-contaminated soil by cold top ex situ vitrification. This paper describes the initial conceptualization of the research demonstration and the results from the bench-scale study. Hexavalent chromium is a well known Group A human carcinogen. There are more than two million tons of leftover chromite ore residues from chromate extraction manufacturing in Hudson County, New Jersey. They contain both unleached haxavalent and unoxidized trivalent chromium. Both forms are considered an environmental and health hazard. In this demonstration study, the cold top ex situ vitrification process was used to remediate the chromium-contaminated soils. This technology evolved from the glass melting industry. Here, the chemical chromate is reduced and immobilized in a siliceous matrix. The bench-scale study included site selection, lab-scale vitrification, physical and chemical characterization of contaminated soils and vitrified soil, evaluation of potential reuse of vitrified soils as construction aggregates, and selection of two potential sites for pilot-scale testing. Nine chromium-contaminated sites were selected for this bench-scale study. The total chromium concentration in soil from the above sites ranged from 0.2 to 2.6% by weight, and the hexavalent chromium in toxicity characteristics leaching procedure (TCLP) leachate was above 30 ppm in some sites. The lab-scale vitrified soils had hexavalent chromium in TCLP leachate below 5 ppm, the regulatory limit, and could be used as construction aggregates. The pilot-scale test performed from soils obtained from two of the above sites demonstrated the cold top ex situ vitrification technology and the potential reuse of vitrified soil in highway construction application as asphalt concrete.

A feasibility study was performed to remediate chromium-contaminated soil by cold top ex situ vitrification. This paper describes the initial conceptualization of the research demonstration and the results from the bench-scale study. Hexavalent chromium is a well known Group A human carcinogen. There are more than two million tons of leftover chromite ore residues from chromate extraction manufacturing in Hudson County, New Jersey. They contain both unleached hexavalent and unoxidized trivalent chromium. Both forms are considered an environmental and health

hazard. In this demonstration study, the cold top ex situ vitrification process was used to remediate the chromium-contaminated soils. This technology evolved from the glass melting industry. Here, the chemical chromate is reduced and immobilized in a siliceous matrix. The bench-scale study included site selection, lab-scale vitrification, physical and chemical characterization of contaminated soils and vitrified soil, evaluation of potential reuse of vitrified soils as construction aggregates, and selection of two potential sites for pilot-scale testing. Nine chromium-contaminated sites were selected for this bench-scale study. The total chromium concentration in soil from the above sites ranged from 0.2 to 2.6% by weight, and the hexavalent chromium in toxicity characteristic leaching procedure (TCLP) leachate was above 30 ppm in some sites. The lab-scale vitrified soils had hexavalent chromium in TCLP leachate below 5 ppm, the regulatory limit, and could be used as construction aggregates. The pilot-scale test performed from soils obtained from two of the above sites demonstrated the cold top ex situ vitrification technology and the potential reuse of vitrified soil in highway construction application as asphalt concrete.

Document Type: Article
Source: Scopus

Dusdorf, W., Muller-Simon, H.
Investigations into the existence of hexavalent chromium in industrial glasses
(1997) *Glass science and technology Frankfurt*, 70 (11), pp. 325-332. Cited 3 times.

Inst fur Silikattechnik, Freiberg, Germany

Abstract
In several melting experiments the existence of hexavalent chromium in soda-lime-silica glasses depending on the oxidation conditions and the presence of iron have been investigated by means of a recently proposed wet chemical analysis procedure. The observed dependence of the concentration of hexavalent chromium on the iron content can be explained by means of an electron exchange between iron and chromium during cooling. The results have been applied to the conditions of industrial glass melting. Under sufficiently reducing conditions and high portions of iron the existence of hexavalent chromium can be excluded. These conditions are fulfilled for all commercial container glasses investigated.

Document Type: Article
Source: Scopus

Dusdorf, W.[a c] , Müller-Simon, H.[b d]
Investigations into the existence of hexavalent chromium in industrial glasses
(1997) *Glass Science and Technology: Glastechnische Berichte*, 70 (11), pp. 325-332. Cited 1 time.

[a] Institut für Silikattechnik, TU Bergakademie Freiberg (Germany), Germany
[b] Huttentechnische Vereinigung D., Frankfurt/M., Germany
[c] TU Bergakademie Freiberg, Institut für Silikattechnik, Leipziger Straße 28, D-09596 Freiberg, Germany
[d] Huttentechnische Vereinigung D., Mendelssohnstraße 75-77, D-60325 Frankfurt/M., Germany

Abstract
In several melting experiments the existence of hexavalent chromium in soda -lime-silica glasses depending on the oxidation conditions and the presence of iron have been investigated by means of a recently proposed wet chemical analysis procedure. The observed dependence of the concentration of hexavalent chromium on the iron content can be explained by means of an electron exchange between iron and chromium during cooling. The results have been

applied to the conditions of industrial glass melting. Under sufficiently reducing conditions and high portions of iron the existence of hexavalent chromium can be excluded. These conditions are fulfilled for all commercial container glasses investigated.

Document Type: Article
Source: Scopus

Bonin, Michel P., Holve, D.J.
Measuring particle size and concentration emissions from electroplating processes
(1996) *Metal Finishing*, 94 (10), pp. 4pp. Cited 2 times.

Insitec Measurement Systems Inc, San Ramon, United States

Abstract
To quantify better both the size distribution and concentration of particles released during chromium plating processes, measurements of particle size and concentration have been made at the chromium plating tank and in the exhaust system at a commercial; hexavalent chromium plating facility. The data obtained are vital to an ongoing study that addresses chromium emissions from plating facilities directly. Additionally, the measurements provided insight into the performance of cyclone separation and mesh-pad abatement devices that the plating facility installed to reduce the amount of chromium released to the environment.

Document Type: Article
Source: Scopus

Schmidt, Mark D., Shelton, Stephen P.
Removal of chromium from groundwater using permeable barriers: an aquifer simulation study
(1994) *National Conference on Environmental Engineering*, pp. 792-803.

Univ of New Mexico, Albuquerque, United States

Abstract
Previous efforts to remediate groundwater contaminated by chromium-bearing industrial wastes have involved post-extraction methods, whereby groundwater is pumped to the surface treated and returned to the aquifer. This practice has proven effective for removing soluble pollutants. However, it is often costly and labor intensive and requires treating large volumes of water. Also, institutional obstacles such as ground and surface water discharge permits and groundwater rights must be considered. An alternative to conventional remediation methods is the in situ permeable barrier process, which intercepts soluble contaminants from solution but allows groundwater to flow through. Trench-based barriers, backfilled with reactive media, result in the direct adsorption of chemical species or the oxidation or reduction of chemical species followed by precipitation. Laboratory studies were conducted to determine the technical feasibility of using trench-based media to remove chromium from groundwater. In batch tests various doses of candidate media and 10g of silica sand were added to glass vials containing a chromium solution. Candidate media included powder-activated carbon, ferric oxide and agricultural limestone. Adsorption isotherms were plotted from batch test results. In aquifer simulation tests a chromium-containing solution was passed through an aquifer simulation model containing silica sand and a vertical barrier of candidate media. Removal of soluble hexavalent chromium (Cr(VI)) to concentrations less than the maximum contaminant level (MCL) for total chromium in drinking water (0.05 mg/l) was demonstrated with all candidate media in the aquifer simulation model. Adsorption appeared to be the principle mechanism of removal for all candidate media considered. Information gained from experience with

the physical model was used in developing a computer generated, 1-D solute transport model to predict the movement of hexavalent chromium in an aquifer system.

Document Type: Conference Paper
Source: Scopus

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Bray, D.J.
Toxicity of chromium compounds formed in refractories
(1985) *American Ceramic Society Bulletin*, 64 (7), pp. 1012-1016. Cited 54 times.

Aluminum Co. of America, Alcoa Center, PA 15069, United States

Abstract
Refractory materials consist of a variety of chemical species combined to develop properties for high temperature applications. When these refractory materials are exposed to severe environments, which may include high temperature, high pressure, and a multitude of chemical reactants, a possibility exists that toxic by-products or waste materials will form. In this work, the conditions under which carcinogenic forms of chromium are formed have been outlined.

Document Type: Article
Source: Scopus

Drake, Robert A.
ENVIRONMENTAL AGENCIES TARGET CHROMIUM EMISSIONS FOR ACTION.
(1985) *Glass Industry*, 66 (4), pp. 28-30.

Glass Technical Inst, Vienna, VA,, USA, Glass Technical Inst, Vienna, VA, USA

Abstract
The federal Environmental Protection Agency (EPA) and the California Air Resources Board are developing regulations on chromium as a toxic air contaminant emitted from glass furnaces. The agencies seem to agree that hexavalent chrome is carcinogenic and mutagenic and there is some question on the toxicity of trivalent chrome. The EPA has a document 'Health Assessment of Chromium' EPA-600/8-83-014A containing 328 pages of results of an investigation. The California Assembly Bill 1807, Tanner (AB1807), became effective on Jan. 1, 1984, directing air pollution authorities to identify and control toxic air emissions.

Document Type: Article
Source: Scopus

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Database: SCOPUS
Search: Glass AND Cadmium AND Manufacturing

Citation + Abstracts + References (Brief Citations)

Scopus

Recommended Documents on Scopus

Sent to you by: jerry.w.curry@state.or.us

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Documents

(1) Riffault, V.[a] , Arndt, J.[b] , Marris, H.[a c] , Mbengue, S.[a] , Setyan, A.[a c d] , Alleman, L.Y.[a] , Deboudt, K.[c] , Flament, P.[c] , Augustin, P.[c] , Delbarre, H.[c] , Wenger, J.[b]
Fine and ultrafine particles in the vicinity of industrial activities: A review
(2015) *Critical Reviews in Environmental Science and Technology*, 45 (21), pp. 2305-2356.

DOI: 10.1080/10643389.2015.1025636

[a] Département Sciences de l'Atmosphère et Génie de l'Environnement, Mines Douai, France
[b] Department of Chemistry and Environmental Research Institute, University College Cork, Cork, Ireland
[c] Laboratoire de Physico-Chimie de l'Atmosphère (ULCO), Dunkerque, France
[d] Empa, Swiss Federal Laboratories for Materials Science and Technology, Laboratory for Analytical Chemistry, Dubendorf, Switzerland

Abstract
This review synthesizes the existing knowledge on the characteristics of PM2.5 at sites under the direct influence of industrial emissions, with a specific focus on their morphology, size distributions and chemical composition. Results from online and off-line analytical techniques indicate a high temporal and spatial variability of mass size distribution and chemical composition depending on the type of industrial processes, the sampling distances and frequencies, and the meteorological conditions. Tracers of specific activities have been identified in a number of studies and may help to provide estimates of the relative contribution of pollutant sources from heavily industrialized areas. © 2015 Taylor & Francis Group, LLC.

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Critical review and meta-analysis of ambient particulate matter source apportionment using receptor models in Europe
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Hazardous waste characterization among various thermal processes in South Korea: A comparative analysis
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Abstract
Ministry of Environment, Republic of Korea (South Korea) is in progress of converting its current hazardous waste classification system to harmonize it with the international standard and to set-up the regulatory standards for toxic substances present in the hazardous waste. In the present work, the concentrations along with the trend of 13 heavy metals, F-, CN- and 19 PAH present in the hazardous waste generated among various thermal processes (11 processes) in South Korea were analyzed along with their leaching characteristics. In all thermal processes, the median concentrations of Cu (3.58-209,000mg/kg), Ni (BDL-1560mg/kg), Pb (7.22-5132.25mg/kg) and Zn (83.02-31419mg/kg) were comparatively higher than the other heavy metals. Iron & Steel thermal process showed the highest median value of the heavy metals Cd (14.76mg/kg), Cr (166.15mg/kg) and Hg (2.38mg/kg). Low molecular weight PAH (BDL-37.59mg/kg) was predominant in sludge & filter cake samples present in most of the thermal processes. Comparatively flue gas dust present in most of the thermal processing units resulted in the higher leaching of the heavy metals. © 2013 Elsevier B.V.

Author Keywords
Hazardous waste; Heavy metals; Metallurgy; Poly aromatic hydrocarbon; Thermal process

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Abstract
Heavy metals retention [Pb 2+, Cd 2+, Ni 2+, and Cr(VI)] on recycled waste porous glass (RWPG) from solid wastes sorting operations was carried out. To the purpose metals containing solutions in the concentration range 2-4 mg/L, reproducing the average concentration present in, e.g., solid waste leachate from landfills or industrial effluents, were percolated onto columns loaded with RWPG beads with particle size in the range 0.35-1.0 mm and flow-rates between 0.23 and 0.75 L/h. Metals retention mechanism was associated with ion exchange with overall capacities in the following order: Pb 2+ > Cd 2+ > Ni 2+ > Cr(VI) in consideration of the hydrated ion radius and free energy of hydration of the metal ions. The rate controlling step was identified with the ions interdiffusion in the Nernst liquid film around particles. The metals exhausted beads were embedded into cement conglomerates as inert materials thus minimizing metals release in the environment. The prepared mortar specimen showed improved thermal properties as compared to conventional (sand based) composites. © 2011 American Chemical Society.

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Abstract
A total of 94 (54 males, 40 females) healthy adult residents living in an industrial city in northern Taiwan were recruited to study their exposure to industrial metals by measuring their blood levels of V, Cr, Mn, Ni, Co, As, Se, Mo, Cd, Pb, and W. All participants were non-smokers without obvious direct occupational exposure to these elements, although by working in administrative sectors in industrial facilities their indirect or potential exposure was increased. The average concentrations of V, Cr, Mn, Ni, Co, As, Se, Mo, Cd, Pb, and W in blood were 0.30, 1.49, 15.1, 3.84, 2.73, 21.1, 204, 3.2, 0.76, 51.1, and 0.40 ng/mL, respectively. These values were significantly higher than reference values reported for the general population, in some cases exceeding those of occupationally exposed workers. The principal component and correlation analyses among blood element levels suggested that the predominant sources of exposure were glass manufacturing and traffic-related sources. Despite of some limitations, the study demonstrates that the residents in this industrial area may suffer adverse chronic health effects attributable to exposures to these elements. © Springer Science+Business Media, LLC 2011.

Author Keywords
Biological monitoring; Environmental exposure; Internal dose; Trace elements

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Abstract
Leaching tests conducted on raw sludge wastes from a glass components manufacturing factory using the US EPA TCLP procedure showed that Pb, Hg, As and Ba leached at pH<3.5 whilst Cd and Cr did not. To control the leaching, asphalt, a mixture of asphalt and powdered activated carbon (PAC) and Portland cement were used as fixing agents to stabilize the sludge. Leaching tests on the stabilized sludge using leachants of pH 2.5-7.0 showed that the lowest leachate metal concentration were obtained from the sludge which had been stabilized using a mixture of asphalt and PAC. Portland cement at a cement-to-sludge ratio of 0.5 also reduced the leaching of metals from the solidified sludge with metals concentrations in the leachate lower than the US EPA regulatory limits.

Author Keywords
Heavy metals; Leaching; Sludge disposal; Solidification; Toxic sludge

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Chemical and microbial remediation of hexavalent chromium from contaminated soil and mining/metallurgical solid waste: A review

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Abstract
Chromium is a highly toxic non-essential metal for microorganisms and plants, and its occurrence is rare in nature. Lower to higher chromium containing effluents and solid wastes released by activities such as mining, metal plating, wood preservation, ink manufacture, dyes, pigments, glass and ceramics, tanning and textile industries, and corrosion inhibitors in cooling water, induce pollution and may cause major health hazards. Besides, natural processes (weathering and biochemical) also contribute to the mobility of chromium which enters in to the soil affecting the plant growth and metabolic functions of the living species. Generally, chemical processes are used for Cr- remediation. However, with the inference derived from the diverse Cr-resistance mechanism displayed by microorganisms and the plants including biosorption, diminished accumulation, precipitation, reduction of Cr(VI) to Cr(III), and chromate efflux, bioremediation is emerging as a potential tool to address the problem of Cr(VI) pollution. This review focuses on the chemistry of chromium, its use, and toxicity and mobility in soil, while assessing its concentration in effluents/wastes which becomes the source of pollution. In order to conserve the environment and resources, the chemical/biological remediation processes for Cr(VI) and their efficiency have been summarised in some detail. The interaction of chromium with various microbial/bacterial strains isolated and their reduction capacity towards Cr(VI) are also discussed. © 2013 Elsevier B.V..

Author Keywords
Bioremediation; Chromium toxicity; Cr(VI) contaminated soil; Cr(VI) reduction; Cr(VI) resistance

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Abstract
It has been determined that airborne particles of hexavalent Chromium, Cr +6, pose a number of possible health threats, of which, both employers and employees need to be made aware. Understanding and implementing OSHA STANDARD 29CFR-1910.1026 and its supporting documentation will provide protection for your employees, contractors and the community-at-large. This paper is presented by permission of Saint Gobain Corporation, Valley Forge, PA.

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Abstract
The National Institute for Occupational Safety and Health (NIOSH) conducted 21 field surveys in selected industries to characterize workers' exposures to hexavalent chromium-containing airborne particulate and to evaluate existing technologies for controlling these exposures. Hexavalent chromium Cr(VI) is a respiratory irritant and chronic inhalation may cause lung cancer. Primary evaluation methods included collection of full work shift, personal breathing-zone (PBZ) air samples for Cr(VI), measurement of ventilation system parameters, and documentation of processes and work practices. This study emphasized evaluation of engineering exposure control measures, so PBZ exposures were measured on the outside of personal protective equipment, for example, respirators. Field surveys were conducted in two chromium electroplating facilities, including one where full-shift PBZ exposures to Cr(VI) ranged from 3.0 to 16 times the 1 µg/m3NIOSH recommended exposure limit (REL) despite several engineering controls on the plating tanks. At a painting and coating facility that used Cr(VI)-containing products, full-shift exposures of painters and helpers (2.4 to 55 µg/m3) exceeded the REL, but LEV effectiveness was limited. Other operations evaluated included welding in construction; metal cutting operations on chromium-containing materials in ship breaking; chromate-paint removal with abrasive blasting; atomized alloy-spray coating; foundry operations; printing; and the manufacture of refractory brick, colored glass, prefabricated concrete products, and treated wood products. NIOSH researchers concluded that, in many of the evaluated processes, Cr(VI) exposures at or below the current NIOSH REL are achievable. However, for some processes, it is unclear whether controlling exposures to this range is consistently achievable without respirator use. Some operations involving the application of coatings and finishes may be among those most difficult to control to this range. Most operations judged to be moderately difficult to control to this range involve joining and cutting metals with relatively high chromium content. Nonetheless, exposures in a wide variety of other processes were judged more easily controllable to the current REL or below, or were found to be minimal, including some operations meeting the general descriptions named above but with different specific operating parameters producing lower Cr(VI) exposures.

Author Keywords
Chromium; Engineering controls; Exposure assessment; Exposure controls; Field study; Hexavalent chromium

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Abstract
An automated continuous instrument for the collection and measurement of aerosol Cr(VI) is described. The system alternately collects the sample on one of two glass fiber filters. After 15-min sample collection on one filter, the sampling switches over to the second filter. The freshly sampled filter is washed for 8.5 min, and the washings are preconcentrated on a minicolumn packed with anion exchange resin. The washed filter is dried with filtered hot air for the next 6.5 min so that it is ready for sampling at the end of the 15-min cycle. The preconcentrated Cr(VI) on the column is eluted with 0.1 M sodium perchlorate and then reacted with sym-1,5-diphenylcarbazide prior to absorbance detection with a light emitting diode-based dedicated flow-through absorbance detector. The detection limit (S/N = 3) is 5 ng of Cr(VI)/m3, orders of magnitude lower than current regulatory requirements. The instrument operates unattended over long periods. In continuous round-the-clock operation, filter replacement frequency is every 24-72 h, depending on dust loading. The system is portable for facile field deployment and permits fully automated rapid determinations at a very low analysis cost per sample.

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Abstract
The EC Directive 94/62 on packaging and packaging waste set out the permissible concentration levels of the four heavy metals Pb, Cd, Hg and hexavalent chromium in packaging. Article 10 of the Directive encourages the development of analytical procedures for the determination of these elements and the preparation of suitable reference materials. Since 1994 Technical Committee 2 of the International Commission of Glass participated in the preparation of a trace elements reference glass containing lead and cadmium at concentrations comparable with the proposed limit values. The glass reference materials have been certified within a project conducted and financed under the Standards, Materials and Testing Programme of EU and is now available as CRM 664. This report summarizes the results obtained during the study and recommends a specific analytical procedure for the analysis of Pb and Cd in glass. The determination of mercury and hexavalent chromium, that were not included in the CRM, will be the object of future publications.

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Remediation of chromium-contaminated soils: Bench-scale investigation

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Abstract
A feasibility study was performed to remediate chromium-contaminated soil by cold top ex situ vitrification. This paper describes the initial conceptualization of the research demonstration and the results from the bench-scale study. Hexavalent chromium is a well known Group A human carcinogen. There are more than two million tons of leftover chromite ore residues from chromate extraction manufacturing in Hudson County, New Jersey. They contain both unleached haxavalent and unoxidized trivalent chromium. Both forms are considered an environmental and health hazard. In this demonstration study, the cold top ex situ vitrification process was used to remediate the chromium-contaminated soils. This technology evolved from the glass melting industry. Here, the chemical chromate is reduced and immobilized in a siliceous matrix. The bench-scale study included site selection, lab-scale vitrification, physical and chemical characterization of contaminated soils and vitrified soil, evaluation of potential reuse of vitrified soils as construction aggregates, and selection of two potential sites for pilot-scale testing. Nine chromium-contaminated sites were selected for this bench-scale study. The total chromium concentration in soil from the above sites ranged from 0.2 to 2.6% by weight, and the hexavalent chromium in toxicity characteristics leaching procedure (TCLP) leachate was above 30 ppm in some sites. The lab-scale vitrified soils had hexavalent chromium in TCLP leachate below 5 ppm, the regulatory limit, and could be used as construction aggregates. The pilot-scale test performed from soils obtained from two of the above sites demonstrated the cold top ex situ vitrification technology and the potential reuse of vitrified soil in highway construction application as asphalt concrete.

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Abstract
In several melting experiments the existence of hexavalent chromium in soda-lime-silica glasses depending on the oxidation conditions and the presence of iron have been investigated by means of a recently proposed wet chemical analysis procedure. The observed dependence of the concentration of hexavalent chromium on the iron content can be explained by means of an electron exchange between iron and chromium during cooling. The results have been applied to the conditions of industrial glass melting. Under sufficiently reducing conditions and high portions of iron the existence of hexavalent chromium can be excluded. These conditions are fulfilled for all commercial container glasses investigated.

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Abstract
In several melting experiments the existence of hexavalent chromium in soda -lime-silica glasses depending on the oxidation conditions and the presence of iron have been investigated by means of a recently proposed wet chemical analysis procedure. The observed dependence of the concentration of hexavalent chromium on the iron content can be explained by means of an electron exchange between iron and chromium during cooling. The results have been applied to the conditions of industrial glass melting. Under sufficiently reducing conditions and high portions of iron the existence of hexavalent chromium can be excluded. These conditions are fulfilled for all commercial container glasses investigated.

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  Redox chemistry of iron-manganese and iron -chromium interactions in soda lime silicate glass melts
  (1996) *Glastech. Ber. Glass Sci. Technol.*, 69 (9), pp. 269-277.

- Knupp, R.C., Berger, D.F.
  Effects of iron in ultraviolet absorbing green glass
  (1966) *Glass Ind.*, 47 (5), pp. 252-256.

- Hahn, B.
  (1994) *Empfindliche und Schnelle Methode zur Bestimmung von Cr(VI) in Natron-Kalk-Silikat-Gläsern*, Document no. 19b-94 of subcommittee "Glasanalyse" of the Technical Committee I of the German Society of Glass Technology (DGG). Frankfurt/M

- Hahn, B.
  Pers. commun.

- Lange, J.
  Chemische Analyse glasiger Systeme
  (1991) *Leipzig: Dtsch. Verl. Grundstoffind.*, p. 123.

Document Type: Article
Source: Scopus

Bonin, Michel P., Holve, D.J.
Measuring particle size and concentration emissions from electroplating processes
(1996) *Metal Finishing*, 94 (10), pp. 4pp. Cited 2 times.

Insitec Measurement Systems Inc, San Ramon, United States

Abstract
To quantify better both the size distribution and concentration of particles released during chromium plating processes, measurements of particle size and concentration have been made at the chromium plating tank and in the exhaust system at a commercial; hexavalent chromium plating facility. The data obtained are vital to an ongoing study that addresses chromium emissions from plating facilities directly. Additionally, the measurements provided insight into the performance of cyclone separation and mesh-pad abatement devices that the plating facility installed to reduce the amount of chromium released to the environment.

Document Type: Article
Source: Scopus

Schmidt, Mark D., Shelton, Stephen P.
Removal of chromium from groundwater using permeable barriers: an aquifer simulation study
(1994) *National Conference on Environmental Engineering*, pp. 792-803.

Univ of New Mexico, Albuquerque, United States

Abstract
Previous efforts to remediate groundwater contaminated by chromium-bearing industrial wastes have involved post-extraction methods, whereby groundwater is pumped to the surface treated and returned to the aquifer. This practice has proven effective for removing soluble pollutants. However, it is often costly and labor intensive and requires treating large volumes of water. Also, institutional obstacles such as ground and surface water discharge permits and groundwater rights must be considered. An alternative to conventional remediation methods is the in situ permeable barrier process, which intercepts soluble contaminants from solution but allows groundwater to flow through. Trench-

based barriers, backfilled with reactive media, result in the direct adsorption of chemical species or the oxidation or reduction of chemical species followed by precipitation. Laboratory studies were conducted to determine the technical feasibility of using trench-based media to remove chromium from groundwater. In batch tests various doses of candidate media and 10g of silica sand were added to glass vials containing a chromium solution. Candidate media included powder-activated carbon, ferric oxide and agricultural limestone. Adsorption isotherms were plotted from batch test results. In aquifer simulation tests a chromium-containing solution was passed through an aquifer simulation model containing silica sand and a vertical barrier of candidate media. Removal of soluble hexavalent chromium (Cr(VI)) to concentrations less than the maximum contaminant level (MCL) for total chromium in drinking water (0.05 mg/l) was demonstrated with all candidate media in the aquifer simulation model. Adsorption appeared to be the principle mechanism of removal for all candidate media considered. Information gained from experience with the physical model was used in developing a computer generated, 1-D solute transport model to predict the movement of hexavalent chromium in an aquifer system.

Document Type: Conference Paper
Source: Scopus

Bray, D.J.
Toxicity of chromium compounds formed in refractories
(1985) *American Ceramic Society Bulletin*, 64 (7), pp. 1012-1016. Cited 54 times.

Aluminum Co. of America, Alcoa Center, PA 15069, United States

Abstract
Refractory materials consist of a variety of chemical species combined to develop properties for high temperature applications. When these refractory materials are exposed to severe environments, which may include high temperature, high pressure, and a multitude of chemical reactants, a possibility exists that toxic by-products or waste materials will form. In this work, the conditions under which carcinogenic forms of chromium are formed have been outlined.

Document Type: Article
Source: Scopus

Drake, Robert A.
ENVIRONMENTAL AGENCIES TARGET CHROMIUM EMISSIONS FOR ACTION.
(1985) *Glass Industry*, 66 (4), pp. 28-30.

Glass Technical Inst, Vienna, VA,, USA, Glass Technical Inst, Vienna, VA, USA

Abstract
The federal Environmental Protection Agency (EPA) and the California Air Resources Board are developing regulations on chromium as a toxic air contaminant emitted from glass furnaces. The agencies seem to agree that hexavalent chrome is carcinogenic and mutagenic and there is some question on the toxicity of trivalent chrome. The EPA has a document 'Health Assessment of Chromium' EPA-600/8-83-014A containing 328 pages of results of an investigation. The California Assembly Bill 1807, Tanner (AB1807), became effective on Jan. 1, 1984, directing air pollution authorities to identify and control toxic air emissions.

Document Type: Article
Source: Scopus

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Reg. no. 33156677. VAT no. NL 005033019B01.

This email has been sent by jerry.w.curry@state.or.us.

Riffault, V.[a] , Arndt, J.[b] , Marris, H.[a c] , Mbengue, S.[a] , Setyan, A.[a c d] , Alleman, L.Y.[a] , Deboudt, K.[c] , Flament, P.[c] , Augustin, P.[c] , Delbarre, H.[c] , Wenger, J.[b]

Fine and ultrafine particles in the vicinity of industrial activities: A review

(2015) *Critical Reviews in Environmental Science and Technology*, 45 (21), pp. 2305-2356.

DOI: 10.1080/10643389.2015.1025636

[a] Département Sciences de l'Atmosphère et Génie de l'Environnement, Mines Douai, France
[b] Department of Chemistry and Environmental Research Institute, University College Cork, Cork, Ireland
[c] Laboratoire de Physico-Chimie de l'Atmosphère (ULCO), Dunkerque, France
[d] Empa, Swiss Federal Laboratories for Materials Science and Technology, Laboratory for Analytical Chemistry, Dubendorf, Switzerland

Abstract
This review synthesizes the existing knowledge on the characteristics of PM2.5 at sites under the direct influence of industrial emissions, with a specific focus on their morphology, size distributions and chemical composition. Results from online and off-line analytical techniques indicate a high temporal and spatial variability of mass size distribution and chemical composition depending on the type of industrial processes, the sampling distances and frequencies, and the meteorological conditions. Tracers of specific activities have been identified in a number of studies and may help to provide estimates of the relative contribution of pollutant sources from heavily industrialized areas. © 2015 Taylor & Francis Group, LLC.

Shin, S.K., Kim, W.-I.L., Jeon, T.-W., Kang, Y.-Y., Jeong, S.-K., Yeon, J.-M., Somasundaram, S.

Hazardous waste characterization among various thermal processes in South Korea: A comparative analysis

(2013) *Journal of Hazardous Materials*, 260, pp. 157-166. Cited 2 times.

DOI: 10.1016/j.jhazmat.2013.05.022

Resource Recirculation Research Division, Environmental Resources Research Department, National Institute of Environmental Research, Hwangyeong-ro 42, Seo-gu, Incheon 404-708, South Korea

Abstract
Ministry of Environment, Republic of Korea (South Korea) is in progress of converting its current hazardous waste classification system to harmonize it with the international standard and to set-up the regulatory standards for toxic substances present in the hazardous waste. In the present work, the concentrations along with the trend of 13 heavy metals, F-, CN- and 19 PAH present in the hazardous waste generated among various thermal processes (11 processes) in South Korea were analyzed along with their leaching characteristics. In all thermal processes, the median concentrations of Cu (3.58-209,000mg/kg), Ni (BDL-1560mg/kg), Pb (7.22-5132.25mg/kg) and Zn (83.02-31419mg/kg) were comparatively higher than the other heavy metals. Iron & Steel thermal process showed the highest median value of the heavy metals Cd (14.76mg/kg), Cr (166.15mg/kg) and Hg (2.38mg/kg). Low molecular weight PAH (BDL-37.59mg/kg) was predominant in sludge & filter cake samples present in most of the thermal processes. Comparatively flue gas dust present in most of the thermal processing units resulted in the higher leaching of the heavy metals. © 2013 Elsevier B.V.

Author Keywords
Hazardous waste; Heavy metals; Metallurgy; Poly aromatic hydrocarbon; Thermal process

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Petrella, A., Petrella, M., Boghetich, G., Basile, T., Petruzzelli, V., Petruzzelli, D.

Heavy metals retention on recycled waste glass from solid wastes sorting operations: A comparative study among different metal species

(2012) *Industrial and Engineering Chemistry Research*, 51 (1), pp. 119-125.

DOI: 10.1021/ie202207d

Dipartimento di Ingegneria Delle Acque e Chimica, Politecnico di Bari, 4, Via E.Orabona, 70125 Bari, Italy

Abstract
Heavy metals retention [Pb 2+, Cd 2+, Ni 2+, and Cr(VI)] on recycled waste porous glass (RWPG) from solid wastes sorting operations was carried out. To the purpose metals containing solutions in the concentration range 2-4 mg/L, reproducing the average concentration present in, e.g., solid waste leachate from landfills or industrial effluents, were percolated onto columns loaded with RWPG beads with particle size in the range 0.35-1.0 mm and flow-rates between 0.23 and 0.75 L/h. Metals retention mechanism was associated with ion exchange with overall capacities in the following order: Pb 2+ > Cd 2+ > Ni 2+ > Cr(VI) in consideration of the hydrated ion radius and free energy of hydration of the metal ions. The rate controlling step was identified with the ions interdiffusion in the Nernst liquid film around particles. The metals exhausted beads were embedded into cement conglomerates as inert materials thus minimizing metals release in the environment. The prepared mortar specimen showed improved thermal properties as compared to conventional (sand based) composites. © 2011 American Chemical Society.

Lin, T.-S.[a] , Wu, C.-C.[b]
Internal exposure to trace elements in non-smoking residents living in a northern Taiwan industrial city
(2011) *Biological Trace Element Research*, 144 (1-3), pp. 36-48.

DOI: 10.1007/s12011-011-9021-1

[a] Department of Safety, Health, and Environmental Engineering, National United University, 1 Lien Da, Miaoli City 360, Taiwan
[b] Department of Public Health, China Medical University, Taichung, Taiwan

Abstract
A total of 94 (54 males, 40 females) healthy adult residents living in an industrial city in northern Taiwan were recruited to study their exposure to industrial metals by measuring their blood levels of V, Cr, Mn, Ni, Co, As, Se, Mo, Cd, Pb, and W. All participants were non-smokers without obvious direct occupational exposure to these elements, although by working in administrative sectors in industrial facilities their indirect or potential exposure was increased. The average concentrations of V, Cr, Mn, Ni, Co, As, Se, Mo, Cd, Pb, and W in blood were 0.30, 1.49, 15.1, 3.84, 2.73, 21.1, 204, 3.2, 0.76, 51.1, and 0.40 ng/mL, respectively. These values were significantly higher than reference values reported for the general population, in some cases exceeding those of occupationally exposed workers. The principal component and correlation analyses among blood element levels suggested that the predominant sources of exposure were glass manufacturing and traffic-related sources. Despite of some limitations, the study demonstrates that the residents in this industrial area may suffer adverse chronic health effects attributable to exposures to these elements. © Springer Science+Business Media, LLC 2011.

Author Keywords
Biological monitoring; Environmental exposure; Internal dose; Trace elements

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Yaziz, M.I., Chin, F.L., Tang, S.N., Bich, N.N.
Heavy metal leaching of solidified sludge from a glass components industry
(1999) *Journal of Environmental Science and Health - Part A Toxic/Hazardous Substances and Environmental Engineering*, 34 (4), pp. 853-861. Cited 3 times.

Department of Environmental Science, Universiti Putra Malaysia, 43400 Serdang, Selangor, Malaysia

Abstract
Leaching tests conducted on raw sludge wastes from a glass components manufacturing factory using the US EPA TCLP procedure showed that Pb, Hg, As and Ba leached at pH<3.5 whilst Cd and Cr did not. To control the leaching, asphalt, a mixture of asphalt and powdered activated carbon (PAC) and Portland cement were used as fixing agents to stabilize the sludge. Leaching tests on the stabilized sludge using leachants of pH 2.5-7.0 showed that the lowest leachate metal concentration were obtained from the sludge which had been stabilized using a mixture of asphalt and PAC. Portland cement at a cement-to-sludge ratio of 0.5 also reduced the leaching of metals from the solidified sludge with metals concentrations in the leachate lower than the US EPA regulatory limits.

Author Keywords
Heavy metals; Leaching; Sludge disposal; Solidification; Toxic sludge

To: McClintock, Katie[McClintock.Katie@epa.gov]; Cunningham, Roylene[Cunningham.Roylene@epa.gov]
From: Keenan, John
Sent: Fri 2/26/2016 4:51:46 PM
Subject: RE: hollingsworth and vose

I'll see if I have some time today.

What's the ref for Cd in locomotive exhaust? I recall CARB doing an analysis and only finding Cr above the detection limits. Looks like this is one paper from 2000: http://www.arb.ca.gov/fuels/diesel/102000swri_dslemssn.pdf

John E. Keenan

U.S. EPA

Region 10 (OCE-101)

1200 Sixth Avenue - Ste 900

Seattle, WA 98101

206-553-1817

206-553-1762 (fax)

From: McClintock, Katie
Sent: Friday, February 26, 2016 8:19 AM
To: Cunningham, Roylene <Cunningham.Roylene@epa.gov>; Keenan, John <keenan.john@epa.gov>
Subject: RE: hollingsworth and vose

There is no great urgency. Just figured it would be good to know slightly less than nothing in case the issue gets elevated.

I'm also curious to learn more about the railyard nearby or other or sources but not sure if that is something we should be doing. With the confusing met data and the recent opb article pointing the finger at Cd from locomotive exhaust, it made me curious to learn more. Ever glass facility so far is on the rail line (spectrum, uroboros, Northstar, bullseye).

katie

From: Cunningham, Roylene
Sent: Friday, February 26, 2016 8:12 AM
To: McClintock, Katie <McClintock.Katie@epa.gov>; Keenan, John <keenan.john@epa.gov>
Subject: Re: hollingsworth and vose

I could look into this next week. I'm not able to do this today.

From: McClintock, Katie
Sent: Thursday, February 25, 2016 9:13:46 PM
To: Keenan, John; Cunningham, Roylene
Subject: hollingsworth and vose

Citizens have asked if this source in OR could be emitting cadmium or other metals. Either of you want to poke around and learn more about them?

Katie McClintock

Air Enforcement Officer

EPA Region 10

1200 Sixth Avenue, Suite 900, OCE-101

Seattle, WA 98101

Phone: 206-553-2143

Fax: 206-553-4743

Mcclintock.katie@epa.gov

To: McClintock, Katie[McClintock.Katie@epa.gov]
From: Hastings, Janis
Sent: Fri 2/26/2016 1:58:08 AM
Subject: Re: Fwd: Emissions information for modeling

Thanks! Nice work.

Jan

From: McClintock, Katie <mcclintock.katie@epa.gov>
Sent: Thursday, February 25, 2016 5:19 PM
Subject: Fwd: Emissions information for modeling
To: Hastings, Janis <hastings.janis@epa.gov>

Spectrum and Steve have the following plan. I'll put more info in my update. Steve and I talked this afternoon.

Katie

Sent from my iPhone

Begin forwarded message:

From: Steve Van Slyke < SteveV@pscleanair.org>
Date: February 25, 2016 at 5:12:16 PM PST
To: " kyleb@spectrumglass.com" < kyleb@spectrumglass.com>
Cc: "Katie McClintock (mcclintock.katie@epa.gov)" < mcclintock.katie@epa.gov>, Carole Cenci < CaroleC@pscleanair.org>
Subject: RE: Emissions information for modeling

Kyle,

Thank you for talking with me regarding the information and analysis discussed below. I understand that you need to discuss this with others to identify the time it would take to provide us with the information we talked about. If you, your staff, or any others assisting you with this information have questions, please do not hesitate to contact me or Carole Cenci in our office (cc'd on this message). She manages our engineers and is aware of the information we are seeking. Based on our phone conversation today, I understand that you anticipate letting us know early next week when this information will be available to us.

Thanks,

Steve

Steve Van Slyke, P.E.
Interim Director of Compliance
Puget Sound Clean Air Agency
1904 3rd Ave., Suite 105
Seattle, WA 98101-3317

(206) 689-4052
(206) 343-7522 (fax)

SteveV@pscleanair.org

From: McClintock, Katie [mailto:McClintock.Katie@epa.gov]
Sent: Wednesday, February 24, 2016 9:42 PM
To: kyleb@spectrumglass.com; Steve Van Slyke
Subject: Emissions information for modeling

Kyle and Steve,

I am emailing both of you to start a dialogue about emissions information needed for modeling. Kyle, as I mentioned, Steve is with Puget Sound Clean Air Agency and his agency can require and do air toxics modeling. As I understand it they can also require companies to do more complicated dispersion modeling as well. However, at this point I think the first step is to get the annual usages of various metals. I know you have concerns about CBI but these total numbers are not cbi. I will work with my attorney to get a more complete answer regarding the CBI. Puget sound may have information they can provide as well. Also we can do the formal process of requesting the information through 114 and requiring you to substantiate your cbi claim and then making our own determination if we must. It takes time and I think we all understand that getting a handle on this information sooner rather than later is important.

You asked questions about what this modeling is and I will leave that to Steve (or his staff) to explain more as he sees fit. Generally modeling is a computer program that allows regulators to calculate/predict the effect of a source on the area surrounding it based on information like stack height, flow, and quantity of emissions. More complex dispersion models can look at more detailed information to build a more accurate profile. This information is a useful way for regulators to evaluate a source without ambient monitors and without having to wait for various weather patterns or operating conditions in order to understand potential emission effects.

Steve, do you (or the staff you assign to this) have any information to add? I was thinking I would use our process to get this information but I certainly would be fine if you all want to take the torch and start your process instead. I'm sure Kyle would be willing to work directly with you. He and I have been communicating regularly and he has been working to provide records diligently.

Katie McClintock

Air Enforcement Officer

EPA Region 10

1200 Sixth Avenue, Suite 900, OCE-101

Seattle, WA 98101

Phone: 206-553-2143

Fax: 206-553-4743

Mcclintock.katie@epa.gov

To: McClintock, Katie[McClintock.Katie@epa.gov]; Palma, Ted[Palma.Ted@epa.gov]; Stewart, Michael[Stewart.Michael@epa.gov]
From: Rimer, Kelly
Sent: Thur 2/25/2016 6:57:33 PM
Subject: RE: McClintock, Katie has shared 'Colored Glass'

Thanks!

From: McClintock, Katie
Sent: Thursday, February 25, 2016 1:45 PM
To: Palma, Ted <Palma.Ted@epa.gov>; Stewart, Michael <Stewart.Michael@epa.gov>; Rimer, Kelly <Rimer.Kelly@epa.gov>
Cc: McClintock, Katie <McClintock.Katie@epa.gov>
Subject: McClintock, Katie has shared 'Colored Glass'

Madonna Narvaez said you might like access to our colored glass info. I also send a daily update email so please let me know if you would like to receive that.

Go to Colored Glass

To: McClintock, Katie[McClintock.Katie@epa.gov]
Cc: Rimer, Kelly[Rimer.Kelly@epa.gov]
From: Stewart, Michael
Sent: Thur 2/25/2016 6:46:35 PM
Subject: RE: McClintock, Katie has shared 'Colored Glass'

Thank you Katie- I would also like to receive the daily updates

Michael J. Stewart, Ph.D.
Environmental Protection Specialist
Health and Environmental Impacts Division
U.S. Environmental Protection Agency
Research Triangle Park, NC 27711
(919) 541-7524
stewart.michael@epa.gov

From: McClintock, Katie
Sent: Thursday, February 25, 2016 1:45 PM
To: Palma, Ted <Palma.Ted@epa.gov>; Stewart, Michael <Stewart.Michael@epa.gov>; Rimer, Kelly <Rimer.Kelly@epa.gov>
Cc: McClintock, Katie <McClintock.Katie@epa.gov>
Subject: McClintock, Katie has shared 'Colored Glass'

Madonna Narvaez said you might like access to our colored glass info. I also send a daily update email so please let me know if you would like to receive that.

Go to Colored Glass

To: McClintock, Katie[McClintock.Katie@epa.gov]
From: Mitchell, Ken
Sent: Thur 2/25/2016 5:27:57 PM
Subject: RE: Information on Art Glass Manufacturers

Yes....Kevin, Lee, and me. Thanks.

Kenneth L. Mitchell, Ph.D. | Special Assistant to the Director |
Air, Pesticides, and Toxics Management Division
U.S. Environmental Protection Agency | 61 Forsyth Street, SW | Atlanta, GA 30303
Voice: 404-562-9065 | Fax: 404-562-9066 | Email: mitchell.ken@epa.gov
Healthier Families, Cleaner Communities, A Stronger America

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From: McClintock, Katie
Sent: Thursday, February 25, 2016 12:27 PM
To: Mitchell, Ken <Mitchell.Ken@epa.gov>
Subject: RE: Information on Art Glass Manufacturers

I forgot to ask, would you all also like to get the daily updates/news clips emails (one per day)?

From: Mitchell, Ken
Sent: Thursday, February 25, 2016 9:24 AM
To: McClintock, Katie <McClintock.Katie@epa.gov>
Cc: Taylor, Kevin <Taylor.Kevin@epa.gov>; Spagg, Beverly <Spagg.Beverly@epa.gov>; Russo, Todd <Russo.Todd@epa.gov>; Dubose, Dick <DuBose.Dick@epa.gov>; Page, Lee <Page.Lee@epa.gov>; Mitchell, Ken <Mitchell.Ken@epa.gov>
Subject: FW: Information on Art Glass Manufacturers

Katie....please see the note below and attached from Kevin Taylor on our staff. Hope you find it useful.

BTW....we did not get the email yesterday from Janet McCabe. Do you know if it was sent out?

Also…can you add Kevin Taylor, Lee Page, and me to the 1-drive for this effort? Thanks.

Kenneth L. Mitchell, Ph.D. | Special Assistant to the Director |
Air, Pesticides, and Toxics Management Division
U.S. Environmental Protection Agency | 61 Forsyth Street, SW | Atlanta, GA 30303
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From: Taylor, Kevin
Sent: Wednesday, February 24, 2016 4:27 PM
To: Mitchell, Ken <Mitchell.Ken@epa.gov>
Cc: Spagg, Beverly <Spagg.Beverly@epa.gov>; Russo, Todd <Russo.Todd@epa.gov>; Dubose, Dick <DuBose.Dick@epa.gov>
Subject: Information on Art Glass Manufacturers

Ken,

As a follow up to our conference call this morning on art glass manufacturing, this is some information that I found on the internet that may be useful to HQ in trying to locate other stain glass manufacturers. They may have this information already but, just in case, you may want to make them aware of it.

Ed Hoy's International states on their website that they are the largest North American art glass distributor. They also have a listing of some of the largest art glass manufacturers in the U.S., including Bullseye, Spectrum and Northstar (all of which were discussed on the conference call). However, there are no companies listed for the southeast.

http://edhoy.com/art-glass-manufacturers/

Attached is a pdf of the Sourcebook for the Stain Glass Association of America. Pages 86 to 103 of the pdf has a listing of members, associates and affiliates for the trade group. I did see Bullseye listed.

Sincerely,

Kevin I. Taylor

Environmental Engineer

U.S. EPA Region 4

Air Enforcement Section, 12th Floor

61 Forsyth Street, S.W.

Atlanta, Georgia 30303

(404) 562-9134

(404) 562-9163 (fax)

Email: taylor.kevin@epa.gov

To: McClintock, Katie[McClintock.Katie@epa.gov]
Cc: Taylor, Kevin[Taylor.Kevin@epa.gov]; Spagg, Beverly[Spagg.Beverly@epa.gov]; Russo, Todd[Russo.Todd@epa.gov]; Dubose, Dick[DuBose.Dick@epa.gov]; Page, Lee[Page.Lee@epa.gov]; Mitchell, Ken[Mitchell.Ken@epa.gov]
From: Mitchell, Ken
Sent: Thur 2/25/2016 5:23:40 PM
Subject: FW: Information on Art Glass Manufacturers
Sourcebook-2015OE.pdf

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From: Taylor, Kevin
Sent: Wednesday, February 24, 2016 4:27 PM
To: Mitchell, Ken <Mitchell.Ken@epa.gov>
Cc: Spagg, Beverly <Spagg.Beverly@epa.gov>; Russo, Todd <Russo.Todd@epa.gov>; Dubose, Dick <DuBose.Dick@epa.gov>
Subject: Information on Art Glass Manufacturers

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information that I found on the internet that may be useful to HQ in trying to locate other stain glass manufacturers. They may have this information already but, just in case, you may want to make them aware of it.

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Sincerely,

Kevin I. Taylor

Environmental Engineer

U.S. EPA Region 4

Air Enforcement Section, 12th Floor

61 Forsyth Street, S.W.

Atlanta, Georgia 30303

(404) 562-9134

(404) 562-9163 (fax)

Email: taylor.kevin@epa.gov

To: McClintock, Katie[McClintock.Katie@epa.gov]
From: Hastings, Janis
Sent: Thur 2/25/2016 7:17:26 AM
Subject: Re: Colored Glass Daily Update 2-24-16

Thanks, Katie. Useful update from PSCAA.

Jan

From: McClintock, Katie
Sent: Wednesday, February 24, 2016 10:41 PM
To: Averback, Jonathan; Barber, Anthony; Barnett, Keith; Bray, Dave; Bremer, Kristen; Cunningham, Roylene; Dalrymple, Anne; Davis, Alison; Davis, Matthew; Doster, Brian; Downey, Scott; Fairchild, Susan; Field, Chris; Fleming, Sheila; Franklin, Richard; Fried, Gregory; Froikin, Sara; Hall, Chris; Hastings, Janis; Hedgpeth, Zach; Holsman, Marianne; Ingemansen, Dean; Johnson, Steffan; Kaetzel, Rhonda; Keenan, John; Koerber, Mike; Koprowski, Paul; Kowalski, Ed; Leefers, Kristin; Lynch, Kira; Martenson, Eric; Matthews, Julie; McLerran, Dennis; Moon, Wally; Narvaez, Madonna; Owens, Katharine; Pirzadeh, Michelle; Rodman, Sonja; Smith, Judy; Stern, Allyn; Stifelman, Marc; Terada, Calvin; Terry, Sara; Thrift, Mike; Tonel, Monica; Wendel, Arthur; Williamson, Ann; Wroble, Julie
Subject: Colored Glass Daily Update 2-24-16

Note to people who are identifying sources – borosilicate manufactures of colored glass identified in my update (I did more research to corroborate after heard from one of the companies).

Katie McClintock

Air Enforcement Officer

EPA Region 10

1200 Sixth Avenue, Suite 900, OCE-101

Seattle, WA 98101

Phone: 206-553-2143

Fax: 206-553-4743

Mcclintock.katie@epa.gov

To: McClintock, Katie[McClintock.Katie@epa.gov]
From: MacIntyre, Mark
Sent: Thur 2/25/2016 6:41:28 AM
Subject: Re: No sign of Portland-like air pollution in Seattle - seattlepi.com

Do you know is anyone has ever visited the GlassyBaby kiln & hotshop in Madrona to measure emissions?

Sent from my iPhone

On Feb 24, 2016, at 10:03 PM, McClintock, Katie <McClintock.Katie@epa.gov> wrote:

Thanks for sharing Mark. I'm surprised it took this long for press to pick it up up here. It definitely tells a rosier picture than reality is since Spectrum does not have all of its glass production controlled with baghouses. I'll add this link to my daily update.

Katie

From: MacIntyre, Mark
Sent: Wednesday, February 24, 2016 10:00 PM
To: Holsman, Marianne <Holsman.Marianne@epa.gov>; Philip, Jeff <Philip.Jeff@epa.gov>; Smith, Judy <Smith.Judy@epa.gov>; Barber, Anthony <Barber.Anthony@epa.gov>; McClintock, Katie <McClintock.Katie@epa.gov>; Downey, Scott <Downey.Scott@epa.gov>
Subject: Fwd: No sign of Portland-like air pollution in Seattle - seattlepi.com

FYI only!!!

Sent from my iPhone

Begin forwarded message:

From: Mark MacIntyre <mmseattleite@yahoo.com>
Date: February 24, 2016 at 9:53:37 PM PST
To: Mark MacIntyre <macintyre.mark@epa.gov>
Subject: No sign of Portland-like air pollution in Seattle - seattlepi.com

http://www.seattlepi.com/local/environment/article/No-sign-of-Portland-like-metal-air-

pollution-in-6852591.php

Sent from my iPad

To: McClintock, Katie[McClintock.Katie@epa.gov]
Cc: Taylor, Kevin[Taylor.Kevin@epa.gov]
From: Spagg, Beverly
Sent: Wed 2/24/2016 9:46:54 PM
Subject: FW: Information on Art Glass Manufacturers
Sourcebook-2015OE.pdf

From: Taylor, Kevin
Sent: Wednesday, February 24, 2016 4:27 PM
To: Mitchell, Ken <Mitchell.Ken@epa.gov>
Cc: Spagg, Beverly <Spagg.Beverly@epa.gov>; Russo, Todd <Russo.Todd@epa.gov>; Dubose, Dick <DuBose.Dick@epa.gov>
Subject: Information on Art Glass Manufacturers

Ken,

As a follow up to our conference call this morning on art glass manufacturing, this is some information that I found on the internet that may be useful to HQ in trying to locate other stain glass manufacturers. They may have this information already but, just in case, you may want to make them aware of it.

Ed Hoy's International states on their website that they are the largest North American art glass distributor. They also have a listing of some of the largest art glass manufacturers in the U.S., including Bullseye, Spectrum and Northstar (all of which were discussed on the conference call). However, there are no companies listed for the southeast.

http://edhoy.com/art-glass-manufacturers/

Attached is a pdf of the Sourcebook for the Stain Glass Association of America. Pages 86 to 103 of the pdf has a listing of members, associates and affiliates for the trade group. I did see Bullseye listed.

Sincerely,

Kevin I. Taylor

Environmental Engineer

U.S. EPA Region 4

Air Enforcement Section, 12th Floor

61 Forsyth Street, S.W.

Atlanta, Georgia 30303

(404) 562-9134

(404) 562-9163 (fax)

Email: taylor.kevin@epa.gov

To: McClintock, Katie[McClintock.Katie@epa.gov]
From: Steve Van Slyke
Sent: Wed 2/24/2016 6:37:08 PM
Subject: FW: Spectrum statements
removed.txt

What Spectrum is saying:

Jufiblue - Julie Thornton shared Creative Glass Guild's post.

February 11 at 1:13pm

This is going on in the world of glass.

Creative Glass Guild

February 11 at 8:20am · Bristol, United Kingdom

Some of you may have seen the recent press regarding an environmental issue surrounding the art glass industry in the USA. We want to reassure our customers by sharing this statement from Spectrum, who are our main glass supplier:

"Recently, the subject of air quality around the Bullseye Glass factory, in Portland, Oregon, received a lot of press, specifically as it related to arsenic and cadmium. So we thought we would share some facts about the manufacturing process employed here at Spectrum Glass Company, including all the steps we take to minimize any impact our production might have on our surrounding community in Woodinville.

First, arsenic is not a component in any of our products and we do not use any form of raw cadmium in our factory. The only form of cadmium used at Spectrum is a pre-melted, glassified cadmium that is added to make some of our products, namely red, orange and yellow glasses.

Even though this cadmium is in a glassified state when added as a colorant, our furnace baghouses do play an important role in capturing contaminants that may be related to this

material. Due to the size of our furnaces, we use baghouse pollution control equipment to filter the exhaust coming from our furnaces. This equipment is checked at least once per day while in operation to ensure it's functioning properly. We also have baghouses that filter the air that is ventilated from our iridescent coating application process, and batch department, where product ingredients are combined prior to melting.

Spectrum is routinely evaluating our equipment and process modifications to reduce emissions, and are regularly subject to inspections by the Puget Sound Clean Air Agency. We are in full compliance with all Washington State environmental regulations, including our Puget Sound Clean Air Agency permit.

Out of an abundance of caution, however, we have contacted the Air Agency specifically to determine if there are any areas of our operation that we could improve. We hope that this information helps to answer questions you may have about any impact the materials produced at Spectrum Glass Company might have on our community here in Woodinville. Worker and community safety are our highest priorities."

http://www.spectrumglass.com/stained-gl…/CleanAirEfforts.asp

To: McClintock, Katie[McClintock.Katie@epa.gov]
From: Hastings, Janis
Sent: Wed 2/24/2016 4:57:44 PM
Subject: Re: does this look good for the 9am call?

Yes, backdrop is that ODEQ has been looking into air toxics in Portland for years. They reached out to USFS to help further define where metals sources might be.

From: McClintock, Katie <mcclintock.katie@epa.gov>
Sent: Wednesday, February 24, 2016 8:50 AM
Subject: does this look good for the 9am call?
To: Hastings, Janis <hastings.janis@epa.gov>, Bray, Dave <bray.dave@epa.gov>

- Air studies: USFS moss study to find hot spots, state air monitoring, results
- Types of sources, location of sources (near daycares/schools)
- Public response
- Discuss source of emissions in glass process (aka metals added for coloring the glass)
- Discuss current knowledge of health concerns presented by arsenic, cadmium, and chromium
- Reaction of the sources (voluntary suspension of use of arsenic, cadmium, chromium)
- inspections (Bullseye, Uroboros, Spectrum, Northstar)
- Internal agency responses/ongoing work
  - Understanding universe
  - Understanding emissions
  - Understanding controls
  - Looking at applicability of 6S

Katie McClintock

Air Enforcement Officer

EPA Region 10

1200 Sixth Avenue, Suite 900, OCE-101

Seattle, WA 98101

Phone: 206-553-2143

Fax: 206-553-4743

Mcclintock.katie@epa.gov

To: McClintock, Katie[McClintock.Katie@epa.gov]
From: DAVIS George
Sent: Wed 2/24/2016 4:17:22 PM
Subject: RE: Questions about chromium III reactions

Thank you, Katie, I'll look this over ASAP. And yes, we'll definitely reach out to you or other EPA folks as needed.

It was nice to see you and John, too, and thanks again.

George

From: McClintock, Katie [mailto:McClintock.Katie@epa.gov]
Sent: Tuesday, February 23, 2016 9:24 PM
To: DAVIS George
Subject: FW: Questions about chromium III reactions
Importance: High

Some heavy (but good) reading on hex chrome and its formation at high temperatures. Looks like burning chrome trioxide at super high temperatures did not create much hex chrome. Bullseye I think is looking at Cr2O3, but still could be useful. Let me know if you have any specific questions you want me to pass along or you can of course reach out to the experts in this email chain as well.

Was nice to see you yesterday. Let me know if I can be of help in any way.

Katie

From: Narvaez, Madonna
Sent: Tuesday, February 23, 2016 12:05 PM
To: McClintock, Katie <McClintock.Katie@epa.gov>
Cc: Johnson, Steffan <johnson.steffan@epa.gov>; Fairchild, Susan <Fairchild.Susan@epa.gov>
Subject: FW: Questions about chromium III reactions
Importance: High

Here is work that the National Risk Management Lab did on chromium reactions at high

temperatures. It is possible they may be able to do calculations for higher temperatures.

From: Rosati, Jacky
Sent: Tuesday, February 23, 2016 10:51 AM
To: Nunez, Carlos <Nunez.Carlos@epa.gov>
Cc: McKinney, Doug <Mckinney.Douglas@epa.gov>
Subject: Fw: Questions about chromium III reactions

FYI - we are working on this .....

Dr. Jacky Ann Rosati Rowe

Chief, Air Pollution Technology Branch (APTB)

National Risk Management Research Lab

Air Pollution Protection and Control Division

109 TW Alexander Drive, E305-01

Research Triangle Park, NC 27711

Phone 919.541.9429

Blackberry 919.597-9831

Fax 919.541.0554

rosati.jacky@epa.gov

From: Linak, Bill
Sent: Tuesday, February 23, 2016 1:49 PM
To: Lee, Chun-Wai; Rosati, Jacky
Subject: RE: Questions about chromium III reactions

CW, Jacky:

Back in the early 90s, we were interested in Cr6+ emissions from incineration, and performed modeling (equilibrium calculations) and combustion experiments to examine Cr6+/total Cr behavior in a furnace burning natural gas laced with Cr3+ and Cr6+. The publication from this study is attached.

We incinerated aqueous solutions of Cr3+ (Cr(NO3)3) and Cr6+ (CrO3) separately and in the presence of Cl (1000 and 7000 ppm) and/or S (1000 and 7000 ppm) to examine how those constituents affect Cr speciation.

We were most interested in the possibility of forming stable CrCl6 and/or CrOCl4 (Cr6+) when Cl was present, and if Cr(SO4)3 (Cr3+) might be preferred if S was present. The equilibrium calculations (Fig 1) suggests that CrCl6 is thermodynamically favored at low temperatures, but the presence of even small amounts of S favors Cr(SO4)3. The experimental data (Fig 3) seems to support this.

Please note that the equilibrium calculations do not predict many Cr6+ compounds (dashed curves) at high temperatures, but we did not extend our calculations above 2200 K (1900 C), higher than most peak incineration temperatures. Also, equilibrium calculations only determine the possibility of stable species, and do not include the kinetic rates of reactions to achieve equilibrium. Systems approach equilibrium, but if the reaction kinetics are slow, it may take a very long time to achieve. Chromium species considered in the calculations are listed in Table 1.

The 2800 C temperatures identified below are extremely high, but are consistent with adiabatic flame temperatures for oxy methane, ethane, or acetylene flames. We did not examine this regime, but it might be possible to form stable CrO3 (6+) under these conditions. However, as noted on Fig 3, we burned aqueous CrO3 and measured only small amounts of Cr6+ in the exhaust. That is, CrO3 formed early at high temperatures likely would not survive reactions later in the post flame in a furnace environment. However, from what little I know of artisanal glass making, if CrO3 were formed and then escaped the high temperatures and quickly quenched, it might survive into the environment even though it is not thermodynamically favored.

It's been about 25 years since we did this work. However, I will try to see if we still have a working equilibrium code and see if we might calculate equilibrium for an oxy system at 2800 C.

Bill

From: Lee, Chun-Wai
Sent: Tuesday, February 23, 2016 12:17 PM
To: Linak, Bill <Linak.Bill@epa.gov>
Subject: FW: Questions about chromium III reactions

The request from R10.

CW

From: Rosati, Jacky
Sent: Tuesday, February 23, 2016 9:31 AM
To: Lee, Chun-Wai <Lee.Chun-Wai@epa.gov>
Subject: Fwd: Questions about chromium III reactions

Can you help Rohit?

Sent from my iPhone

Begin forwarded message:

> **From:** "Nunez, Carlos" <Nunez.Carlos@epa.gov>
> **Date:** February 22, 2016 at 8:23:37 PM EST
> **To:** "Rosati, Jacky" <Rosati.Jacky@epa.gov>
> **Cc:** "McKinney, Doug" <Mckinney.Douglas@epa.gov>
> **Subject: Fwd: Questions about chromium III reactions**
>
> Jacky
>
> Is anyone in your branch with experience/knowledge on combustion chemistry of Cr? You can respond directly to Rohit.
>
> Thanks!

Sent from my iPhone

Begin forwarded message:

From: "Mathur, Rohit" <Mathur.Rohit@epa.gov>
Date: February 22, 2016 at 5:42:50 PM EST
To: "Nunez, Carlos" <Nunez.Carlos@epa.gov>
Cc: "Stanek, Lindsay" <Stanek.Lindsay@epa.gov>
Subject: FW: Questions about chromium III reactions

Hi Carlos:

I received the query below. Does anyone in NRMRL work on Cr and combustion chemistry who could help?

Thanks, Rohit

From: Mathur, Rohit
Sent: Monday, February 22, 2016 5:40 PM
To: Narvaez, Madonna <Narvaez.Madonna@epa.gov>
Subject: RE: Questions about chromium III reactions

Hello Madonna:

Thank you for reaching out to us with your question on Cr. Though we have modeled

Cr3 and 6 air concentrations, we have essentially treated them as inert tracers in the atmosphere. I and colleagues in my Division am not familiar with the combustion chemistry at 2800 deg C. perhaps a person more familiar with characterizing Cr emissions may know – I'll check with a few colleagues to see if they have any suggestions. You are probably already familiar with the following:

http://www3.epa.gov/airtoxics/hlthef/chromium.html

Also, there is some literature on atmospheric chemical pathways for Cr (see for example):

http://pubs.acs.org/doi/pdf/10.1021/es00001a029

Will let you know if I find anything else.

Rohit

From: Narvaez, Madonna
Sent: Monday, February 22, 2016 12:22 PM
To: Mathur, Rohit <Mathur.Rohit@epa.gov>
Subject: Questions about chromium III reactions
Importance: High

Good morning, Rohit. Anne Pope gave your name as someone who might be an expert or familiar with chromium chemistry in air. We have an art and architecture glass melting facility in Portland, Oregon where the Oregon DEQ has discovered through ambient monitoring some cadmium and arsenic hotspots within 220 meters of the facility, as well as another, smaller art glass melting facility in a different part of the city. We have since learned that the facility uses hexavalent chromium as a dry colorant, as well as trivalent chromium. The furnaces use oxyfuel to increase the temperatures needed to make the glass. They argue that as a result, the reactions are occurring in a reducing environment. They have suspended use of hex chrome and cadmium for the time being, but tell us that to stay in business, they need to start using Cr+3 again. They have not done any stack testing, so we do not know the emissions actually coming off the furnaces. They want to show by mass balance that the Cr+3 will not result in any Cr+6 emissions. I'm not sure how that can be done, if speciated testing is not done. The monitoring the state has done showed an average of 71.5 ng/m3 of total chromium, with a couple of samples having 406 and 438 ng/m3, both on days that the company said they were not running the furnaces.

I am more familiar with the behavior of chromium in wastewater where the point is to get the C+6 converted to Cr+3, and then the Cr+3 reduced to elemental chromium. I don't know what happens if Cr+3 is subjected to 2800 degree C in the presence of oxygen. Can hexavalent chromium be a product of that reaction? I was trying to look up information but could only find the wastewater information. Thanks for your help!

==========

Madonna Narvaez

Regional Air Toxics Coordinator

USEPA, Region 10

1200 Sixth Avenue, Ste 900

MC: AWT-150

phone: 206-553-2117

fax: 206-553-0110

narvaez.madonna@epa.gov

Follow @EPAnorthwest on Twitter! https://twitter.com/EPAnorthwest

To: McClintock, Katie[McClintock.Katie@epa.gov]
From: Hastings, Janis
Sent: Wed 2/24/2016 6:09:54 AM
Subject: RE: PSCAA

That sounds good for you to return his call tomorrow. I'm glad we're coordinating. On top of all you're doing to investigate the facility, my point in talking with him would have been to get him ready for the fact that the spotlight is shifting from Portland, Oregon, to other locations. EPA is going to be saying we're looking at similar facilities nationwide. What is their strategy and timeframe for assessing the impacts at Spectrum and appropriate controls? I think they have a good story to tell. I want to understand it and share it with EPA because we'll be asked. We want to be able to support them. Also, if they're not going to set up an ambient monitor at schools soon, what is their thinking? Just trying to understand. Are they getting all the news stories from Portland? (We could send links.)

I think you'll do great covering these points if you have time. If I can help, let me know.

Feel free to let him know that at the management level, he can call me any time.

Thanks,
Jan

From: McClintock, Katie <mcclintock.katie@epa.gov>
Sent: Tuesday, February 23, 2016 9:05 PM
Subject: RE: PSCAA
To: Hastings, Janis <hastings.janis@epa.gov>

Actually, disregard my previous email. I forgot to check my voicemail from when I was out today and I had one from steve van slyke.

He wants to ask Spectrum for their total metals usages for a year so he can model it. I haven't talked to him yet but I asked spectrum for it tonight to get that going as quick as possible and advised them the info would not be cbi so we could share it with the state/locals.

Steve asked him that I call him to discuss so I think me calling him might be best for today (especially given his tone). It sounds like he has a sense of urgency now and was concerned that he didn't want to wait until we compiled more comprehensive data (we like to verify the source rather than using just company estimates) in order to start his modeling. I think it is a

good sign that they feel this urgency and I will do my best to support it and keep you posted.

Do you want me to bring up the monitor at this point? Was there anything else you wanted to talk to him about?

Katie

From: Hastings, Janis
Sent: Tuesday, February 23, 2016 8:50 PM
To: McClintock, Katie <McClintock.Katie@epa.gov>
Subject: PSCAA

I was planning to call Steve vanSylke tomorrow morning to hear the latest from them. Let me know however if that's duplicating your conversations.

Thanks,

Jan

To: McClintock, Katie[McClintock.Katie@epa.gov]
From: Eric Lovell
Sent: Tue 2/23/2016 11:58:02 PM
Subject: RE: Uroboros response to request for information

No problem, it's good to have it completed. We'll send it out tomorrow…to your address below?

Eric

From: McClintock, Katie [mailto:McClintock.Katie@epa.gov]
Sent: Tuesday, February 23, 2016 3:56 PM
To: Eric Lovell
Subject: RE: Uroboros response to request for information

Eric,

I apologize. Our inspection ran late and then my phone wasn't working so I couldn't reach you. I'm back in Seattle. If you don't mind mailing them it would be great. Sorry for the extra hustle this morning.

Katie McClintock

Air Enforcement Officer

EPA Region 10

1200 Sixth Avenue, Suite 900, OCE-101

Seattle, WA 98101

Phone: 206-553-2143

Fax: 206-553-4743

Mcclintock.katie@epa.gov

From: Eric Lovell [mailto:eric@uroboros.com]
Sent: Tuesday, February 23, 2016 8:44 AM
To: McClintock, Katie <McClintock.Katie@epa.gov>
Subject: RE: Uroboros response to request for information

OK, great. 10:30 to 12 will work fine for a pick-up, thank you. We are just stamping all pages with the confidentiality mark now. If you could give me a closer time for your arrival it would be helpful.

Eric

From: McClintock, Katie [mailto:McClintock.Katie@epa.gov]
Sent: Monday, February 22, 2016 8:53 PM
To: Eric Lovell
Subject: RE: Uroboros response to request for information

Batch tickets sound perfect and I don't need the recipes for now. Thank you for pulling those together. Also the inventory records would be super helpful if that is possible. I am actually in Portland and if it is easier I could pick up the records tomorrow morning if you would like. It would probably be sometime between 10:30-12ish? (I am driving to seattle after that) Mailing is fine too, whichever you prefer.

Katie

From: Eric Lovell [mailto:eric@uroboros.com]
Sent: Monday, February 22, 2016 9:01 AM
To: McClintock, Katie <McClintock.Katie@epa.gov>
Subject: RE: Uroboros response to request for information

OK, that's what I was thinking. We have the batch tickets for you now, though we still need to go back and mark each page 'Proprietary Formulation, CBI'. They will show you the actual weights measured out as you expected. Since we tend to produce 1.5 to 2 months of inventory of any finished product, the 4+ month time span you requested would cover about 2 production cycles for most finished items.

Your request for information also asked for recipes (formulas in our terminology), which show the same information as batch tickets (weights of each raw material) but in 1000 Lb standard weights, hence my query on this topic.

We could also provide inventory reports and purchase records for any raw material for any time period, so that would be another way to get to the total amounts used per raw material. For example, starting inventory, plus purchases, less ending inventory would equal amount used. I think this would be easier than adding up the small amounts over hundreds of batch tickets.

I suggest we send up the copies we've made of the batch tickets so you can get a feel for how they will work for you, then consider what further information you might need.

Please confirm,

Eric L.

From: McClintock, Katie [mailto:McClintock.Katie@epa.gov]
Sent: Saturday, February 20, 2016 8:19 PM
To: Eric Lovell
Subject: RE: Uroboros response to request for information

Hi Eric –

Thank you for your email. We need to get information related to the quantity of each metal used at the facility each day over a period of time. A year would be best, but I am starting with a shorter period of time to lessen the burden. The formulas do not provide information on how much of the different products you make. I need to know how many of each formula you made and the date. If you have access to the batch tickets, then those are the records I need that will help me most accurately and quickly determine the amount of metals used.

Just to make sure I understand why you are asking the question, do you have access to those batch tickets? Are they kept somewhere (or saved in a computer)? If so, this should be easy to produce, even if it is 400 pages. If they are not kept, then we should talk about what records you do have (batch recipes and perhaps another charge/operation log which would show how much of each recipe was made on a particular day). However, if those batch tickets (with actual quantities used per day) exist, then those are the records we are requesting.

Does this help?

Katie

From: Eric Lovell [mailto:eric@uroboros.com]
Sent: Saturday, February 20, 2016 10:48 AM
To: McClintock, Katie <McClintock.Katie@epa.gov>
Subject: RE: Uroboros response to request for information

Would you mind if we re-visit the topic of the batch tickets and recipes? Here's why:

There were in excess of 400 unique batch tickets from the 4+ month period you are examining. Each shows the exact weight of each raw material used, in addition to the melted weight of that mix. The formulas show the same information but in standardized 1000 Lb. quantities. I'm not sure what you'll gain for our effort of collecting and your effort reviewing another 400+ pages with essentially the same information.

Please advise.

Eric L.

From: McClintock, Katie [mailto:McClintock.Katie@epa.gov]
Sent: Friday, February 19, 2016 7:19 PM
To: Eric Lovell
Subject: RE: Uroboros response to request for information

Thank you Eric –

You have been diligent and responsive and I appreciate your frequent check ins about the progress. I will start reviewing this data this weekend and let you know what questions I have.

Katie

From: Eric Lovell [mailto:eric@uroboros.com]
Sent: Friday, February 19, 2016 2:55 PM
To: McClintock, Katie <McClintock.Katie@epa.gov>
Subject: Uroboros response to request for information

Dear Ms. McClintock,

Attached are eight digital files containing much of what you have requested. The first is a written response to each of the questions, and the others contain supporting documents.

I believe this fulfills your request completely, except for the batch tickets and formulas/recipes. We are still working on collecting those documents, and expect to mail those to you in paper form early next week. I apologize if it appears we are being too slow at providing these documents. I can explain what is taking the time if you wish, but we are putting several hours

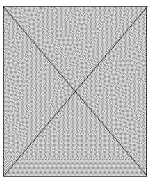
per day into it, and are getting close to having a complete and accurate set for you.

If I have missed anything, if you need additional information, or if you need any explanations of the materials, please let me know.

Sincerely,

Eric L.

Eric Lovell
President



2139 N. Kerby Ave
Portland, OR 97227
503-284-4900 x 201 T
503-284-7584 F

To: McClintock, Katie[McClintock.Katie@epa.gov]
From: Elleman, Robert
Sent: Tue 2/23/2016 8:45:25 PM
Subject: check this out briefly and then give me a call to discuss
MetAndPPTdata.pptx

Katie,

My contacts at Oregon DEQ (Anthony Barnack, Phil Allen, Chris Swab, and others) started sending me a bunch of met data. But then they sent me their analysis, which is pretty much exactly what I would have put together at this point. I am attaching it. Is it small enough to make it to you?

My initial impressions are:

Ex. 5 - Deliberative Process

Rob

Robert Elleman

Meteorologist

EPA Region 10, Seattle

(206) 553-1531

elleman.robert@epa.gov