



(Volume I. Emergent chemicals)

Hexavalent Chromium

CAS No. 18540-29-9



What is Hexavalent Chromium ?

Chromium is an element which is abundantly found in nature in combination with other elements as chromium salts, some of which are soluble in water. The pure metallic form rarely occurs naturally. Chromium does not evaporate, but it can be present in air as particles. Chromium valence states range from 0 to 6. Trivalent chromium [Cr(III)], and hexavalent chromium [Cr(VI), or chromate], are the most common forms. Chromium (III) occurs naturally in many foods and is an essential nutrient, facilitating the body's use of Insulin. Cr(VI) is most often produced by industrial processes and may be an indicator of environmental contamination.

History and Uses: Cr(VI) has been associated with welding (Steel), Chromate production, Chrome Plating, Painters, Candle-making, Printers, Rubber Mfg., Cement. Chromate contamination (from industrial activity) has been observed in soil and groundwater at facilities where sodium dichromate solutions were used to prevent corrosion in piping.

Toxicology:

Cr(VI) can be toxic. When inhaled, it can damage the lining of the nose and throat and irritate the lungs. Based on studies of workers in chromium processing factories, Cr(VI) is classified as a known human carcinogen after chronic inhalation exposures. When ingested in high doses some evidence suggests Cr(VI) may upset the gastrointestinal

tract and damage the liver and kidneys, although there is no evidence that ingestion causes cancer. Cr(VI) is rapidly reduced to the trivalent form after entering the stomach.

Regulation:

²California maintains a 50 µg/L MCL for total Chromium. The US EPA adopted the same standard, but subsequently (in 1991) raised the federal MCL to 100 µg/L. Though Cr(VI) is listed as a CA-"Proposition 65" Carcinogen, it is not considered to pose a significant risk by ingestion, provided that its standards are being met [Title 22, CCR, 12707(b)].

Important Information

Molecular Formula	Cr^{6+}
Molecular Weight	51.996
Public Health Goal (¹ Withdrawn 2001)	2.5 ¹ µg/L (ppb)
DHS Notification Level (² For total Chromium)	50 ² µg/L (ppb)
DHS Detection Limit for Purposes of Reporting (DLR)	1 µg/L (ppb)
Calscience Reporting Limit (RL)	0.2 µg/L (ppb)
Calscience Method Detection Limit (MDL)	0.005 µg/L (ppb)

SAMPLE COLLECTION

- **CONTAINER:** Water samples should be collected into either a 125 ml HDPE (plastic) or glass container.
- **PRESERVATION:** Samples should be kept chilled at 4°C.
- **HOLDING TIME:** (Water) 24 Hours. (Soil) 30 Days.

CONTACTS

For further information on laboratory capabilities, please call:

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Analytical Methodology and Technology

Scope: Analysis for Cr(VI) in drinking water is specified in EPA method 218.6. Low level Cr(VI) can also be analyzed in soil and water using EPA 7199.

Procedure:

Aqueous samples are filtered through a 0.45 mm filter and the filtrate is adjusted to a pH = 9.0 - 9.5 with a buffer solution. The Sample is introduced into an ion chromatograph and passed through a guard column to remove organic materials, then passed through an analytical column to separate Cr(VI). Cr(VI) undergoes post-column derivatization with 1,5-diphenylcarbazide to form a highly colored complex that is detected at 530nm. Current method detection limit (MDL) studies establish a 99% confidence interval at 0.00504 µg/L (ppb) with a verifiable reporting limit (RL) set at 0.2 µg/L (ppb).

Solid samples are extracted using EPA 3060A (alkaline digestion). (MDL=1.91 mg/kg; RL = 40 mg/kg).

Interferences:

1. Samples containing high levels of organic materials and/or sulfides cause rapid reduction of soluble Cr(VI) to Cr(III). 2. High levels of anionic species such as sulfate and

chloride can result in loss of Cr(VI) due to column overload. Poor spike recoveries and peak-tailing are indicative of column overload. (3) Samples containing particles greater than 0.45mm require filtration to prevent damage to instrument columns and flow systems.

