

(Volume I. Emergent chemicals)

Perchlorate

CAS No. 014797-73-0

What is Perchlorate ?

Perchlorate is an anion commonly associated with the solid salts of ammonium, potassium, and sodium perchlorate. In its purest forms, it is a white or colorless crystal or powder. Perchlorate salts dissolve in water and readily move from surface to ground water. Perchlorate is known to originate from both natural and manmade sources.

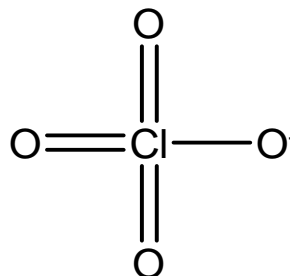
History and Uses

Ammonium Perchlorate manufacture in the United States has been dated to the mid-1940s. Uses of perchlorate include: the manufac-

ture of air-bag inflators, electronic tubes, fertilizer, lubricating oils, matches, paints & enamels, photography, pyrotechnics, rubber, and tanning and finishing leather. Ammonium perchlorate has been used most significantly in Department of Defense (DOD) applications, as a component of explosives and rocket propellant. In this application, perchlorate has a limited shelf life, necessitating occasional replacement and disposal.

Toxicology

Perchlorate has not been linked to cancer in humans. Perchlorate is a human health concern because it



interferes with the uptake of iodine in the thyroid gland. The primary route of exposure is through the consumption of water containing perchlorate.

Regulation

Effective October 18, 2007, Perchlorate is a regulated drinking water contaminant in California, with a maximum contaminant level (MCL) of 6 micrograms per liter ($\mu\text{g/L}$) and a DLR is 0.004 mg/L (4 ppb).

Important Information

Molecular Formula ClO_4^-

Molecular Weight 99.45

MCL $6 \mu\text{g/L}$ (ppb)

DHS Detection Limit for Purposes of Reporting (DLR) $4 \mu\text{g/L}$ (ppb)

Calscience Reporting Limit (RL) by 331.0 $1 \mu\text{g/L}$ (ppb)

Calscience Reporting Limit (RL) by 331.0 $0.1 \mu\text{g/L}$ (ppb)

Calscience Reporting Limit (RL) by 6850 for Soils $2 \mu\text{g/kg}$ (ppb)

Analytical Methodology and Technology

Scope

Calscience offers three methods for the analysis of Perchlorate; EPA 314.0 by IC and EPA 331.0 and EPA 6850 which employ Liquid Chromatography/Mass Spectrometry technology. EPA 6850 is specific for soil.

IC Procedure

The analysis is performed using Ion Chromatography (IC) with a conductivity detector.

Sample matrices with high concentrations of common anions such as chloride, sulfate and carbonate can make the analysis problematic by destabilizing the baseline in the retention time window for perchlorate. This problem can be pervasive in groundwater samples. Prior to analysis, the conductivity of the sample is measured to assess the likelihood of ionic interferences. Interferences may be remedied by sample dilution, or by use of pre-treatment cartridges. Barium cartridges remove Sulfate;

Silver cartridges removes Chloride; and Hydrogen cartridges eliminate carbonate and cationic interferences. Follow-up conductivity determinations are performed to assess the effectiveness of the treatment.

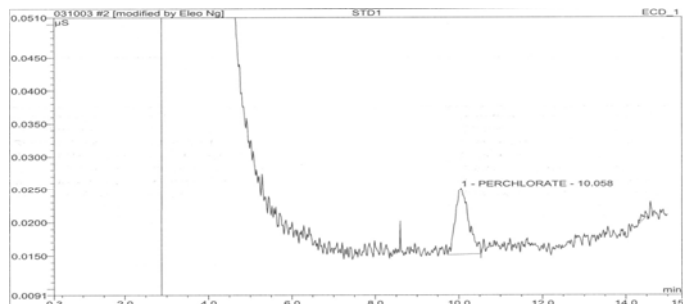
LC/MS/MS Procedure

Separation techniques for the LC/MS/MS methods 331.0 and 6850 are similar to an IC method but a Mass Spectrometer (MS) is used as the detector in place of the conductivity detector used with IC. Unlike the conductivity detector, the MS is

a specific detector. Dual MS detectors are utilized to provide more specificity and lower reporting limits. Certification for Perchlorate by 331.0 is now required in California.

Advantages of LC/MS/MS:

- Matrix problems can be greatly reduced & false positives are essentially eliminated due to the extreme specificity of MS/MS
- Lower detection limits can be achieved due to the reduction in chemical noise.



No.	Ret.Time min	Peak Name	Height μS	Area $\mu\text{S}^*\text{min}$	Ret.Area %	Amount ppb	Type
1	10.05	PERCHLORATE	0.010	0.004	97.02	2.028	BMR*
Total:			0.010	0.004	97.02	2.028	

SAMPLE COLLECTION

- CONTAINER:** Water samples should be collected into a 125 ml HDPE (plastic) or glass container.
- PRESERVATION:** No preservation is required. Refrigeration is not required, though care should be taken to avoid temperature extremes.
- HOLD TIME:** 28 Days.

CONTACTS

For further information on laboratory capabilities, please call:

Bob Stearns at (714) 895-5494 or Kim Banks at 626 458-1032 at the Garden Grove Laboratory

Roger Lahr at 619-632-2438 in San Diego, CA

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