Superfund Records Center
SITE: Metropolitan Metal
BREAK: 17.7
OTHER: 642573

AN: 6769
UD: 9606
ID:
----------SUBSTANCE IDENTIFICATION CATEGORY (USE CODE ZID)----------
PN: CHROMIC-ACID-
SY: *Chronic-anhydride-; *Chromium-trioxide-; *Acide-chromique- (French); *Chromic-(vi)acid
RN: 7738-94-5
RELT: 910 [CHROMIUM]
MF: *Cr-H2-04
SHPN: UN 1755; Chromic acid, solution
UN 1463; Chromic acid, solid
NA 1463; Chromic acid, solid or dry mixture
IMO 5.1; Chromic acid, solid
IMO 8.0; Chromic acid, solution
STCC: 49 302 06; Chronic acid solution
HAZN: D007; A waste containing chromium may or may not be characterized as a hazardous waste following testing by the Toxicity Characteristic Leaching Procedure as prescribed by the Resource Conservation and Recovery Act (RCRA) regulations. /Chromium/
MANF:
---------MANUFACTURING/USEINFORMATION CATEGORY (USE CODE ZMAN)---------
MMFG: *By treating a concentrated solution of a dichromate with strong sulfuric acid in excess. [R1]
FORM: *99.75% pure flake [R2, 52]
USE: *Chromium plating intermediate, medicine (caustic), process engraving, anodizing, ceramic glazes, colored glass, metal cleaning, inks, tanning, paints. [R3]
*Chrome plating, photography, electric batteries, etching, batteries. [R2, 52]
*Chromic anhydride (99.9%) is a strong inorganic acid. Commercial uses include plating, chemical an dyestuff manufacturing, photography, cement manufacturing, and leather tanning. [R4, 925]
*Chromium(VI) oxide has been used as a cauterizing agent, especially to stop nose bleeds. [R5, 242]
CPP:
--------CHEMICAL AND PHYSICAL PROPERTIES CATEGORY (USE CODE ZCPP)--------
COFO: *Dark purplish-red crystals; *red, rhombic; *Brown solid
BP: *decomposes
MP: *196 deg C
MW: *99.99
CORR: *Attacks most metals, particularly copper and brass. Attacks cloth, leather, and some plastics.
DEN: *1.67-2.82
SOL: *Soluble in water, alcohol, and mineral acids.; *Soluble in sulfuric acid and nitric acid.; *... Dissolves readily in water to form a strongly acidic, caustic solution.
OCPP: *Deliquescent
*Hexavalent chromium is linked to oxygen and is a powerful oxidizer, but it does not form

SEMS DocID 642573

coordination compounds, and is easily reduced to chromium trioxide. /Hexavalent chromium/

SAFE:

----------SAFETY AND HANDLING CATEGORY (USE CODE ZSAF)----------

DOT: *Health Hazards: Poisonous if swallowed. Inhalation of dust poisonous. Contact may cause burns to skin and eyes. Fire may produce irritating or poisonous gases. Runoff from fire control or dilution water may cause pollution. /Chromic acid, solid/ [R6,p. G-422]

*Fire or Explosion: May burn rapidly. May ignite other combustible materials (wood, paper, oil, etc). These materials will accelerate burning when they are involved in a fire; some will react violently with fuels. /Chromic acid, solid/ [R6,p. G-42]

*Emergency Action: Keep unnecessary people away; isolate hazard area and deny entry. Positive pressure self-contained breathing apparatus (SCBA) and structural firefighters' protective clothing will provide limited protection. CALL CHEMTREC AT 1-800-424-9300 FOR EMERGENCY ASSISTANCE. If water pollution occurs, notify the appropriate authorities. /Chromic acid, solid/ [R6,p. G-42]

*Fire: Small Fires: Water only; no dry chemical, CO2 or Halon. Large Fires: Flood fire area with water from a distance. Move container from fire area if you can do it without risk. Apply cooling water to sides of containers that are exposed to flames until well after fire is out. Stay away from ends of tanks. For massive fire in cargo area, use unmanned hose holder or monitor nozzles. /Chromic acid, solid/ [R6,p. G-42]

*Spill or Leak: Do not touch or walk through spilled material. Keep combustibles (wood, paper, oil, etc) away from spilled material. Small Dry Spills: With clean shovel place material into clean, dry container and cover loosely; move containers from spill area. Large Spills: Dike far ahead of liquid spill for later disposal. /Chromic acid, solid/ [R6,p. G-42]

*First Aid: Move victim to fresh air; call emergency medical care. In case of contact with material, immediately flush skin or eyes with running water for at least 15 minutes. Remove and isolate contaminated clothing and shoes at the site. /Chromic acid, solid/ [R6,p. G-42]

*Health Hazards: Contact causes burns to skin and eyes. If inhaled, may be harmful. Fire may produce irritating or poisonous gases. Runoff from fire control or dilution water may cause pollution. /Chromic acid, solution/ [R6,p. G-60]

*Fire or Explosion: Some of these materials may burn, but none of them ignites readily. Flammable/poisonous gases may accumulate in tanks and hopper cars. Some of these materials may ignite combustibles (wood, paper, oil, etc). /Chromic acid, solution/ [R6,p. G-60]

*Emergency Action: Keep unnecessary people away; isolate hazard area and deny entry. Stay upwind; keep out of low areas. Positive pressure self-contained breathing apparatus (SCBA) and structural firefighters' protective clothing will provide limited protection. CALL CHEMTREC AT 1-800-424-9300 FOR EMERGENCY ASSISTANCE. If water pollution occurs, notify the appropriate authorities. /Chromic acid, solution/ [R6,p. G-60]

*Fire: Some of these materials may react violently with water. Small Fires: Dry chemical, CO2, water spray or regular foam. Large Fires: Water spray, fog or regular foam. Move container from fire area if you can do it without risk. Apply cooling water to sides of containers that are exposed to flames until well after fire is out. Stay away from ends of tanks. /Chromic acid, solution/ [R6,p. G-60]

*Spill or Leak: Do not touch or walk through spilled material; stop leak if you can do it without risk. Small Spills: Take up with sand or other noncombustible absorbent material and place into containers for later disposal. Small Dry Spills: With clean shovel place material into clean, dry container and cover loosely; move containers from spill area. Large Spills: Dike far ahead of

liquid spill for later disposal. /Chromic acid, solution/ [R6,p. G-60]
*First Aid: Move victim to fresh air; call emergency medical care. In case of contact with material, immediately flush skin or eyes with running water for at least 15 minutes. Remove and isolate contaminated clothing and shoes at the site. Keep victim quiet and maintain normal body temperature. /Chromic acid, solution/ [R6,p. G-60]
FPOT: *Chromic acid is noncombustible, but will accelerate the burning of combustible materials. [R7, 70]
*Will ignite on contact with acetic and alcohol. Hazard may be quite evident. Can ignite organic matter on contact. [R2, 52]
FIRP: *Extinguishing method: use water. [R2, 52]
*If material involved in fire: Extinguish fire using agent suitable for type of surrounding fire. (Material itself does not burn or burns with difficulty.) Use water in flooding quantities as fog. Cool all affected containers with flooding quantities of water. Apply water from as far a distance as possible. [R8]
OFHZ: *Decomposing. Material will form a hot viscous foam and caution should be exercised against possibility of steam explosion. [R2, 52]
EXPL: *Explosiveness: Normally stable. Reactive under extreme conditions. Containers may explode when involved in fire. [R2, 53]
REAC: *Combustible, organic, or other readily oxidizable materials (paper, wood, sulfur, aluminum, plastics, etc); corrosive to metals. [R7, 70]
*Binary reactants: Acetic acid, acetic anhydride, anthracene, ethyl alcohol, phosphorus, potassium ferricyanide, sulfur. [R2, 52]
DCMP: *When heated to decomposition it emits smoke and irritating fumes. [R9]
SERI: *Chromic acid mist or dust can irritate respiratory tract. [R2, 53]
*Very irritating to eyes and respiratory tract. /Chromic trioxide/ [R10]
EQUP: *Recommendations for respirator selection. At any detectable concentration. Respirator Classes: Any self-contained breathing apparatus that has a full facepiece and is operated in a pressure-demand or other positive pressure mode. Any supplied-air respirator with a full face piece and operated in pressure-demand or other positive pressure mode in combination with an auxiliary self-contained breathing apparatus operated in pressure-demand or other positive pressure mode. [R7, 70]
*Recommendations for respirator selection. Escape Conditions: Respirator Classes: Any air-purifying, full-facepiece respirator with a high-efficiency particulate filter. Any appropriate escape-type, self-contained breathing apparatus. [R7, 70]
*Employees should be provided with and required to use impervious clothing, gloves, face shields (eight-inch minimum), and other appropriate protective clothing necessary to prevent any possiblity of skin contact with solids or liquids containing chromic acid or chromates. [R11]
*PRECAUTIONS FOR "CARCINOGENS": ... Dispensers of liq detergent /should be available./ ... Safety pipettes should be used for all pipetting. ... In animal laboratory, personnel should ... wear protective suits (preferably disposable, one-piece & close-fitting at ankles & wrists), gloves, hair covering & overshoes. ... In chemical laboratory, gloves & gowns should always be worn ... however, gloves should not be assumed to provide full protection. Carefully fitted masks or respirators may be necessary when working with particulates or gases, & disposable plastic aprons might provide addnl protection. ... Gowns ... /should be/ of distinctive color, this is a reminder that they are not to be worn outside the laboratory. /Chemical Carcinogens/ [R12, 8]

*Approved respirators, vaseline for lubrication of nostrils, rubberized outer wear, and safety goggles are required. Rubber is poor and PVA not recommended for gloves. White creams should not be relied upon. They can be used to cover unprotected area. Do not use organic clothes as part of outer gear; must be rubberized fabric. [R2, 53]
OPRM: *Wear appropriate equipment to prevent: Any possibility of skin contact. [R7, 70]
*Wear eye protection to prevent: Any possibility of eye contact. [R7, 70]
*Workers should wash: Immediately when skin becomes contaminated. [R7, 70]
*Work clothing should be changed daily: If it is reasonably probable that the clothing may be contaminated. [R7, 70]
*Remove clothing: Immediately if it is non-impervious clothing that becomes contaminated. [R7, 70]
*The following equipment should be available: Eyewash. Quick drench. [R7, 70]
*Contact lenses should not be worn when working with this chemical. [R7, 70]
*SRP: The scientific literature supports the wearing of contact lenses in industrial environments, as part of a program to protect the eye against chemical compounds and minerals causing eye irritation. However, there may be individual substances whose irritating or corrosive properties are such that the wearing of contact lenses would be harmful to the eye. In those specific cases contact lenses should not be worn.
*If material not involved in fire: Keep material out of water sources and sewers. Build dikes to contain flow as necessary. Neutralize spilled material with crushed limestone, soda ash, or lime. [R8]
*Personnel protection: Avoid breathing vapors. Keep upwind. Avoid bodily contact with the material. Do not handle broken packages unless wearing appropriate personal protective equipment. Wash away any material which may have contacted the body with copious amounts of water or soap and water. If contact with the material anticipated, wear appropriate chemical protective clothing. [R8]
*If employees' clothing may have become contaminated with solids or liquids containing chromic acid or chromates, employees should change into uncontaminated clothing before leaving the work premises. [R11]
*Clothing contaminated with chromic acid or chromates should be placed in closed containers for storage until it can be discarded or until provision is made for the removal of suubstance from the clothing. If the clothing is to be laundered or otherwise cleaned to remove the chromic acid or chromates, the person performing the operation should be informed of chromic acid or chromates hazardous properties. [R11]
*Where there is any possibility of exposure of an employee's body to solids or liquids containing chromic acid or chromates, facilities for quick drenching of the body should be provided within the immediate work area for emergency use. [R11]
*Non-impervious clothing which becomes contaminated with chromic acid or chromates should be removed immediately and not reworn until the substance is removed from the clothing. [R11]
*Employees should be provided with and required to use dust- and splash-proof safety goggles where there is any possibility of solids or liquids containing chromic acid or chromates contacting eyes. [R11]
*Where there is any possibility that emloyees' eyes may be exposed to solids or liquids containing chroic acid or chromates, an eye-wash fountain should be provided within the immediate work area for emergency use. [R11]
*PRECAUTIONS FOR "CARCINOGENS": Smoking, drinking, eating, storage of food or of

food & beverage containers or utensils, & the application of cosmetics should be prohibited in any laboratory. All personnel should remove gloves, if worn, after completion of procedures in which carcinogens have been used. They should ... wash ... hands, preferably using dispensers of liq detergent, & rinse ... thoroughly. Consideration should be given to appropriate methods for cleaning the skin, depending on nature of the contaminant. No standard procedure can be recommended, but the use of organic solvents should be avoided. Safety pipettes should be used for all pipetting. /Chemical Carcinogens/ [R12, 8]

*PRECAUTIONS FOR "CARCINOGENS": In animal laboratory, personnel should remove their outdoor clothes & wear protective suits (preferably disposable, one-piece & close-fitting at ankles & wrists), gloves, hair covering & overshoes. ... clothing should be changed daily but ... discarded immediately if obvious contamination occurs ... /also,/ workers should shower immediately. In chemical laboratory, gloves & gowns should always be worn ... however, gloves should not be assumed to provide full protection. Carefully fitted masks or respirators may be necessary when working with particulates or gases, & disposable plastic aprons might provide addnl protection. If gowns are of distinctive color, this is a reminder that they should not be worn outside of lab. /Chemical Carcinogens/ [R12, 8]

*PRECAUTIONS FOR "CARCINOGENS": ... Operations connected with synth & purification ... should be carried out under well-ventilated hood. Analytical procedures ... should be carried out with care & vapors evolved during ... procedures should be removed. ... Expert advice should be obtained before existing fume cupboards are used ... & when new fume cupboards are installed. It is desirable that there be means for decreasing the rate of air extraction, so that carcinogenic powders can be handled without ... powder being blown around the hood. Glove boxes should be kept under negative air pressure. Air changes should be adequate, so that concn of vapors of volatile carcinogens will not occur. /Chemical Carcinogens/ [R12, 8]

*PRECAUTIONS FOR "CARCINOGENS": Vertical laminar-flow biological safety cabinets may be used for containment of in vitro procedures ... provided that the exhaust air flow is sufficient to provide an inward air flow at the face opening of the cabinet, & contaminated air plenums that are under positive pressure are leak-tight. Horizontal laminar-flow hoods or safety cabinets, where filtered air is blown across the working area towards the operator, should never be used ... Each cabinet or fume cupboard to be used ... should be tested before work is begun (eg, with fume bomb) & label fixed to it, giving date of test & avg air-flow measured. This test should be repeated periodically & after any structural changes. /Chemical Carcinogens/ [R12, 9]

*PRECAUTIONS FOR "CARCINOGENS": Principles that apply to chem or biochem lab also apply to microbiological & cell-culture labs ... Special consideration should be given to route of admin. ... Safest method of administering volatile carcinogen is by injection of a soln. Admin by topical application, gavage, or intratracheal instillation should be performed under hood. If chem will be exhaled, animals should be kept under hood during this period. Inhalation exposure requires special equipment. ... unless specifically required, routes of admin other than in the diet should be used. Mixing of carcinogen in diet should be carried out in sealed mixers under fume hood, from which the exhaust is fitted with an efficient particulate filter. Techniques for cleaning mixer & hood should be devised before expt begun. When mixing diets, special protective clothing &, possibly, respirators may be required. /Chemical Carcinogens/ [R12, 9]

*PRECAUTIONS FOR "CARCINOGENS": When ... admin in diet or applied to skin, animals should be kept in cages with solid bottoms & sides & fitted with a filter top. When volatile carcinogens are given, filter tops should not be used. Cages which have been used to house

animals that received carcinogens should be decontaminated. Cage-cleaning facilities should be installed in area in which carcinogens are being used, to avoid moving of ... contaminated /cages/. It is difficult to ensure that cages are decontaminated, & monitoring methods are necessary. Situations may exist in which the use of disposable cages should be recommended, depending on type & amt of carcinogen & efficiency with which it can be removed. /Chemical Carcinogens/ [R12, 10]
*PRECAUTIONS FOR "CARCINOGENS": To eliminate risk that ... contamination in lab could build up during conduct of expt, periodic checks should be carried out on lab atmospheres, surfaces, such as walls, floors & benches, & ... interior of fume hoods & airducts. As well as regular monitoring, check must be carried out after cleaning-up of spillage. Sensitive methods are required when testing lab atmospheres. ... Methods ... should ... where possible, be simple & sensitive. /Chemical Carcinogens/ [R12, 10]
*PRECAUTIONS FOR "CARCINOGENS": Rooms in which obvious contamination has occurred, such as spillage, should be decontaminated by lab personnel engaged in expt. Design of expt should ... avoid contamination of permanent equipment. ... Procedures should ensure that maintenance workers are not exposed to carcinogens. ... Particular care should be taken to avoid contamination of drains or ventilation ducts. In cleaning labs, procedures should be used which do not produce aerosols or dispersal of dust, ie, wet mop or vacuum cleaner equipped with high-efficiency particulate filter on exhaust, which are avail commercially, should be used. Sweeping, brushing & use of dry dusters or mops should be prohibited. Grossly contaminated cleaning materials should not be re-used ... If gowns or towels are contaminated, they should not be sent to laundry, but ... decontaminated or burnt, to avoid any hazard to laundry personnel. /Chemical Carcinogens/ [R12, 10]
*PRECAUTIONS FOR "CARCINOGENS": Doors leading into areas where carcinogens are used ... should be marked distinctively with appropriate labels. Access ... limited to persons involved in expt. ... A prominently displayed notice should give the name of the Scientific Investigator or other person who can advise in an emergency & who can inform others (such as firemen) on the handling of carcinogenic substances. /Chemical Carcinogens/ [R12, 11]
SHIP: *No person may /transport,/ offer or accept a hazardous material for transportation in commerce unless that material is properly classed, described, packaged, marked, labeled, and in condition for shipment as required or authorized by ... /the hazardous materials regulations (49 CFR 171-177)./ [R13]
*Domestic Transportation: Chemical: Chromic acid solution. Primary Hazard Class: Corrosive material. A corrosive material is any liquid or solid that can seriously destroy human skin tissue, or a liquid that produces a severe corrosion rate on steel. UN 1755. Label(s) required: Corrosive. Acceptable Modes of Transportation: Air, rail, road, and water. /Chromic acid solution/ [R14]
*Int'l Air Shipments: Chemical: Chromic and solution. IMO Class: 8. UN 1755. Primary hazard label: Corrosive (packaging group II). Additional packaging instructions listed in the table must also be followed. /Chromic acid solution/ [R15]
*International Water Shipments: Chemical: Chromic acid, solution. IMO Class: 8, corrosive. UN II. Packaging Group: II. Label(s) required: Corrosive. /Chromic acid solution/ [R16]
*Domestic Transportation: Chemical: Chromic acid mixture, dry or chromic acid, solid. Primary Hazard Class: Oxidizer. An oxidizer is a substance that yields oxygen readily to stimulate the combustion of organic and inorganic matter. NA 1463. Label(s) required: Oxidizer. Acceptable Modes of Transportation: Air, rail, road, and water. /Chromic, solid or chromic acid mixture,

dry/ [R14]
*International Water Shipments: Chemical: Chromic acid, solid. IMO Class: 5.1; oxidizing agent, corrosive. UN 1463. Packaging Group: II. Label(s) required: Oxidixing agent, corrosive. /Chromic acid, solid/ [R17]
*PRECAUTIONS FOR "CARCINOGENS": Procurement ... of unduly large amt ... should be avoided. To avoid spilling, carcinogens should be transported in securely sealed glass bottles or ampoules, which should themselves be placed inside strong screw-cap or snap-top container that will not open when dropped & will resist attack from the carcinogen. Both bottle & the outside container should be appropriately labelled. ... National post offices, railway companies, road haulage companies & airlines have regulations governing transport of hazardous materials. These authorities should be consulted before ... material is shipped. /Chemical Carcinogens/ [R12, 13]
*PRECAUTIONS FOR "CARCINOGENS": When no regulations exist, the following procedure must be adopted. The carcinogen should be enclosed in a securely sealed, watertight container (primary container), which should be enclosed in a second, unbreakable, leakproof container that will withstand chem attack from the carcinogen (secondary container). The space between primary & secondary container should be filled with absorbent material, which would withstand chem attack from the carcinogen & is sufficient to absorb the entire contents of the primary container in the event of breakage or leakage. Each secondary container should then be enclosed in a strong outer box. The space between the secondary container & the outer box should be filled with an appropriate quantity of shock-absorbent material. Sender should use fastest & most secure form of transport & notify recipient of its departure. If parcel is not received when expected, carrier should be informed so that immediate effort can be made to find it. Tra
ffic schedules should be consulted to avoid ... arrival on weekend or holiday ... /Chemical Carcinogens/ [R12, 13]
STRG: *Isolate. Protect from physical damage. Separate from combustible, organic, or other readily oxidizable materials. Protect from moisture. Avoid storage on wooden floors. [R2, 52]
*PRECAUTIONS FOR "CARCINOGENS": Storage site should be as close as practical to lab in which carcinogens are to be used, so that only small quantities required for ... expt need to be carried. Carcinogens should be kept in only one section of cupboard, an explosion-proof refrigerator or freezer (depending on chemicophysical properties ...) that bears appropriate label. An inventory ... should be kept, showing quantity of carcinogen & date it was acquired ... Facilities for dispensing ... should be contiguous to storage area. /Chemical Carcinogens/ [R12, 13]
CLUP: *Environmental considerations and land spill: Dig a pit, pond, lagoon, holding area to contain or solid material. Dike surface flow using soil, sand bags, foamed polyurethane, or foamed concrete. Absorb bulk liquid with fly ash or cement powder. Neutralize with agricultural lime (CaO), crushed limestone (CaCO3) or sodium bicarbonate (NaHCO3). [R8]
*Environmental considerations and water spill: Neutralize with agriculture lime (CaO), crushed limestone (CaCO3), or sodium bicarbonate (NaHCO3) Adjust pH to neutral (pH=7) Use mechanical dredges or lifts to remove immobiled masses of pollutants ad precipitates. [R8]
*Environmental considerations, air spill: Apply water spray or mist to kock down vapors. Vapor knockdown water is corrosive or toxic and should be diked for containment. [R8]
*PRECAUTIONS FOR "CARCINOGENS": A high-efficiency particulate arrestor (HEPA) or charcoal filters can be used to minimize amt of carcinogen in exhausted air ventilated safety cabinets, lab hoods, glove boxes or animal rooms ... Filter housing that is designed so that used filters can be transferred into plastic bag without contaminating maintenance staff is avail

commercially. Filters should be placed in plastic bags immediately after removal ... The plastic bag should be sealed immediately ... The sealed bag should be labelled properly ... Waste liquids ... should be placed or collected in proper containers for disposal. The lid should be secured & the bottles properly labelled. Once filled, bottles should be placed in plastic bag, so that outer surface ... is not contaminated ... The plastic bag should also be sealed & labelled. ... Broken glassware ... should be decontaminated by solvent extraction, by chemical destruction, or in specially designed incinerators. /Chemical Carcinogens/ [R12, 15]
DISP: *Generators of waste (equal to or greater than 100 kg/mo) containing this contaminant, EPA hazardous waste number D007, must conform with USEPA regulations in storage, transportation, treatment and disposal of waste. /Chromium/ [R18]
*The following wastewater treatment technologies have been investigated for chronic acid: Concentration process: Reverse Osmosis. [R19]
*PRECAUTIONS FOR "CARCINOGENS": There is no universal method of disposal that has been proved satisfactory for all carcinogenic compounds & specific methods of chem destruction ... published have not been tested on all kinds of carcinogen-containing waste. ... summary of avail methods & recommendations ... /given/ must be treated as guide only. /Chemical Carcinogens/ [R12, 14]
*PRECAUTIONS FOR "CARCINOGENS": ... Incineration may be only feasible method for disposal of contaminated laboratory waste from biological expt. However, not all incinerators are suitable for this purpose. The most efficient type ... is probably the gas-fired type, in which a first-stage combustion with a less than stoichiometric air:fuel ratio is followed by a second stage with excess air. Some ... are designed to accept ... aqueous & organic-solvent solutions, otherwise it is necessary ... to absorb soln onto suitable combustible material, such as sawdust. Alternatively, chem destruction may be used, esp when small quantities ... are to be destroyed in laboratory. /Chemical Carcinogens/ [R12, 15]
*PRECAUTIONS FOR "CARCINOGENS": HEPA (high-efficiency particulate arrestor) filters ... can be disposed of by incineration. For spent charcoal filters, the adsorbed material can be stripped off at high temp & carcinogenic wastes generated by this treatment conducted to & burned in an incinerator. ... LIQUID WASTE: ... Disposal should be carried out by incineration at temp that ... ensure complete combustion. SOLID WASTE: Carcasses of lab animals, cage litter & misc solid wastes ... should be disposed of by incineration at temp high enough to ensure destruction of chem carcinogens or their metabolites. /Chemical Carcinogens/ [R12, 15]
*PRECAUTIONS FOR "CARCINOGENS": ... Small quantities of ... some carcinogens can be destroyed using chem reactions ... but no general rules can be given. ... As a general technique ... treatment with sodium dichromate in strong sulfuric acid can be used. The time necessary for destruction ... is seldom known ... but 1-2 days is generally considered sufficient when freshly prepd reagent is used. ... Carcinogens that are easily oxidizable can be destroyed with milder oxidative agents, such as saturated soln of potassium permanganate in acetone, which appears to be a suitable agent for destruction of hydrazines or of compounds containing isolated carbon-carbon double bonds. Concn or 50% aqueous sodium hypochlorite can also be used as an oxidizing agent. /Chemical Carcinogens/ [R12, 16]
*PRECAUTIONS FOR "CARCINOGENS": Carcinogens that are alkylating, arylating or acylating agents per se can be destroyed by reaction with appropriate nucleophiles, such as water, hydroxyl ions, ammonia, thiols & thiosulfate. The reactivity of various alkylating agents varies greatly ... & is also influenced by sol of agent in the reaction medium. To facilitate the complete reaction, it is suggested that the agents be dissolved in ethanol or similar solvents. ...

No method should be applied ... until it has been thoroughly tested for its effectiveness & safety on material to be inactivated. For example, in case of destruction of alkylating agents, it is possible to detect residual compounds by reaction with 4(4-nitrobenzyl)-pyridine. /Chemical Carcinogens/ [R12, 17]

TOXB:

----------TOXICITY/BIOMEDICAL EFFECTS CATEGORY (USE CODE ZTOB)----------

CARC: *Classification of carcinogenicity: 1) evidence in humans: sufficient; 2) evidence in animals: sufficient. Overall summary evaluation of carcinogenic risk to humans is Group 1: The agent is carcinogenic to humans. /Hexavalent chromium compounds/ [R20]

+CLASSIFICATION: A; human carcinogen. BASIS FOR CLASSIFICATION: Results of occupational epidemiologic studies of chromium-exposed workers are consistent across investigators and study populations. Dose-response relationships have been established for chromium exposure and lung cancer. Chromium-exposed workers are exposed to both cromium III and chromium VI compounds. Because only chromium VI has been found to be carcinogenic in animal studies, however, it was concluded that only chromium VI be classified as a human carcinogen. HUMAN CARCINOGENICITY DATA: Sufficient. /Chromium VI/ [R21]

+A1. A1= Confirmed human carcinogen. (1994) /Water-soluble Cr VI compounds, not otherwise classified/ [R22, 17]

ANTR: *Copious irrigation of acid injuries requires retraction of the eyelids so that the conjunctival cul-de-sacs are well washed. Use anesthetic agents (proparacaine, tetracaine) and retractors as necessary. Be sure to remove all particulate matter. Irrigation should last at least 20 to 30 min. Do not use neutralizing solutions or any other additives. Several liters of saline is required. As long as the lids are retracted, simple intravenous tubing is all that is required to adequately decontaminate the eye. Caustic injuries require a ccomplete eye examination, preferably with a slit lamp, to detect the extent of corneal injury after decontamination. ... /Acids/ [R4, 928]

*Emesis by syrup of ipecac is contraindicated because of reexposure of the esophagus to corrosive material. Charcoal has no place in acid management because it is ineffective and obscures the endoscopic field. Most authors advise against lavage with a soft rubber catheter, and no clinical trials support its use; however, some authors recommended the use of lavage within 1 hour of ingestion (pylorospasm may prolong injury after initial contact) because most esophageal acid injuries are superficial and gastric intubations have not caused complications. ... Remove all contaminated clothes and irrigate exposed skin copiously with saline. Copiously irrigate caustic eye injuries immediately for at least 20-30 minutes. /Acids/ [R4, 928]

*Treatment is symptomatic. The efficacy of BAL, hemodialysis, and exchange transfusion has not been established. /Chromium/ [R4, 1020]

MEDS: *PRECAUTIONS FOR "CARCINOGENS": Whenever medical surveillance is indicated, in particular when exposure to a carcinogen has occurred, ad hoc decisions should be taken concerning ... /cytogenetic and/or other/ tests that might become useful or mandatory. /Chemical Carcinogens/ [R12, 23]

HTOX: *Humans are subject to increased dermatitis or respiratory injury from repeated exposure. [R2, 54]

*Repeated or prolonged exposure to chromic acid or chromate dust or mist may cause an ulceration and perforation of the nasal septum. Respiratory irritation may occur with symptoms resembling asthma. Liver damage with yellow jaundice has been reported. Prolonged or repeated exposure of hte skin may cause a skin rash. Allergic skin rash may also occur. [R11]

*Acute chromic acid ingestion causes an acute gastroenteritis, hepatic necrosis, bleeding, and acute tubular necrosis with renal failure. An intravenous chromic acid exposure resulted in nausea, vomiting, dark red urine, reddish stool, and renal failure which required temporary hemodialysis. Chromic acid burns can result in systemic toxicity. External burns of 10% of the total body surface caused by chromic acid were fatal in one case, whereas 20% burns produced hepatic damage, acute renal failure, and a normochromic and normocytic anemia in another. [R4, 1020]
*Contact causes severe injury characterized by infiltration, vascularizatin, and opacification of the cornea. Chronic exposure to fine droplets in the air from electroplating baths or transfer to the eyes on the fingers causes chronic conjunctival inflammatin and in rare instances a brown band in the superficial layers of the cornea. [R23, 234]
*Hexavalent anionic chromium is topically corrosive, and oral ingestion is toxic. Nephritis, anuria and extensive lesions in the kidey, and gastrointestinal ulceratin are noticed in humans suffering from chromium(VI) toxicity. Chromate contact dermatitis extends from a dry erythematous condition to eczema on the hands and oter exposed parts. Inhalatin of chromium(VI) causes inflammation and ulceration of the nasal mucosa. Pulmonary carcinoma in humans 3-4 years after initial inhalation exposure is linked to chromium(VI); experimental evidence in animals is lacking. [R24]
*Splash contact of concentrated storn acids, such as ... chromic acid ... can prove as severely and devastatingly injurious to the eye as splashes of strong alkalies. [R23, 46]
*Health effects of chromic acid and chromates (as Cr) include suspect carcinogen /cumulative lung damage/, nasal perforation, ulceration. /From table/ [R25]
NTOX: *Hexavalent chromium induced dominant lethal mutations, chromsomal aberrations and micronuclei in rodents treated in vivo. In human cells in vitro, it caused chromosomal aberrations, sister chromatid exchanges and DNA damage. In cultured rodent cells, it induced transformation, chromosomal aberrations, sister chromatid exchanges, mutation and DNA damage. It induced aneuploidy in drosophila and mitotic recombination in yeast. It was mutagenic and caused DNA damage in bacteria. /Hexavalent chromium/ [R26]
*Contact causes severe injury characterized by infiltration, vascularizatin, and opacification of the cornea. Chronic exposure to fine droplets in the air from electroplating baths or transfer to the eyes on the fingers causes chronic conjunctival inflammation and in rare instances a brown band in the superficial layers of the cornea. In rabbit eyes, the discoloratin was not reproducible by application of 1% chromic acid repeatedly, but was induced by applying 5% potassium dichromate solution and exposing the eye to sunlight. [R23, 234]
*Hexavalent anionic chromium is topically corrosive, and oral ingestion is toxic. In rabbits, large doses of chromate cause albuminuria with desquamated cells and renal hyperemia, fatty generatin, the necrosis. Nephritis, anuria and extensive lesions in the kidey, and gastrointestinal ulceratin are noticed in humans suffering from chromium(VI) toxicity. Chromate contact dermatitis extends from a dry erythematous condition to eczema on the hands and oter exposed parts. Inhalatin of chromium(VI) causes inflammation and ulceration of the nasal mucosa. Pulmonary carcinoma in humans 3-4 years after initial inhalation exposure is linked to chromium(VI); experimental evidence in animals is lacking. Intramuscular implantation of chromium trioxide or calcium chromate in rats, however, causes a high percentage of malignant tumors. /Hexavalent anionic chromium/ [R24]
*Hexavalent chromium is topically corrosive, and oral ingestion of chromium(VI) is toxic despite the organism's ability to reduce chromium(VI) to the less toxic chromium(III). Life-term studies

with mice given 5 ppm chromium(VI) in their drinking water showed a slight growth retardation and formation of malignant tumors ... . Laboratory animals can tolerte about 0.1% chromium(VI) in their diet. In rabbits large doses of chromates were followed by albuminuria with desquamated cells; the kidneys showed hyperemia, fatty degeneration, and necrosis. In the past, treatment of warts by local application of chromic acid caused chromium(VI) poisoning in humans, leading to nephritis, anuria, and extensive lesions in the kidneys. ... /Hexavalent chromium/ [R27, 251]
*The effects of the chromic acid mist used in electroplating on the respiratory system of C57BL mice (female; n = 43) were examined histopathologically after exposure for 12 mo to the mist (1.81 mg chromium/cu m-120 min, twice a week). Among the 23 mice sacrificed at 12 mo after the first exposure, three cases of perforation in the nasal septs, a case of proliferative change of the tracheal epithelium, nine cases of emphysema and four of adenomatous metaplasia of the lungs were observed on antopsy. Among the 20 mice which were sacrificed six months after the last exposure, the same changes as the 12 mo exposure group were also observed in the nasal septum, trachea and lungs, but papillomas observed in the nasal epithelia of six mice and adenoma in the lung of a mouse were new findings not seen in the 12 mo exposure group. These results suggest that, in view of the low incidence of spontaneous lung tumor in C57BL mice, inhalation of chromic acid mist in electroplating might be a risk factor of lung can
cer. Additionally, the occurrence of papillomas in the nasal epithelium demonstrates the need of directing attention to the possible development of cancer of the upper respiratory tract in chromium electroplating workers. Upon completion of our five reports on the effects of chromium compounds on the respiratory system, a recapitulation of our experimental studies was made and compared with the findings of a number of reports on chromium. It was experimentally and epidemiologically confirmed that hexavalent chromium compounds act as carcinogens and cause specific biological effects on the respiratory system. These characteristics of hexavalent compounds might be attributable to the strong oxidizing potency and/or high permeability through the cell membrane. Furthermore, hexavalent compounds might be entirely different in biological action from trivalent compounds which are chemically most stable. [R28]
NTXV: *LD50 Dog oral 330 mg/kg [R2, 53]
*LD100 Rat oral 350 mg/kg /From table/ [R27, 252]
*MLD Dog sc 320 mg/kg /From table/ [R27, 252]
IARC: *Classification of carcinogenicity: 1) evidence in humans: sufficient; 2) evidence in animals: sufficient. Overall summary evaluation of carcinogenic risk to humans is Group 1: The agent is carcinogenic to humans. /Hexavalent chromium compounds/ [R20]
ADE: *In experimental studies with animals, chromum(VI) is taken up much more readily than chromium(III). Following oral administration, approximtely 10% of the dose of chromium(VI) is absorbed, whereas less than 0.5% of the chromium(III) dose is absorbed. Chromium(VI) can be reduced to chromium(III) by the GI tract, thereby reducing uptake. Following intratracheal or intravenous exposure, both chromium(III) and (VI) are distributed thorughout the body, with the highest concentrations in liver, kidneys, and lungs, which are the target organs for toxicity. /Chromium (VI)/ [R5, 243]
*Trivalent and hexavalent chromium are the only compounds known to be significantly associated with human disease. Their harmful effects will be easier to understand if the following characteristics are fuly appreciated: 1. In nearly all forms likely to exist in the workplace ... . The hexavalent form easily penetrates the skin. 2. Gastric fluids readily reduce hexavlent to trivalent chromium, the valence known to be significantly absorbed intestinally. Reports of the

percentage of ingested chromium which is absorbed vary widely from 1%-25%, depending on the particular form and ligand environment. ... 3. In most of the forms likely to be encountered in industry, trivalent chromium's passage through cell membranes is inhibited. Hexavalent chromium is not. Thus, from an exposure viewpoint, hexavalent forms are potentially more hazardous. 4. Hexavalent chromium, which readily transits cell membranes, has a short intracellular life, reducing "within minutes to hours" to the potentially carcinogenic trival ent state. [R29, 531]

METB: *Metabolism of chromium(VI) involves cellular reduction of chromium(VI) by small molecules and enzyme systems, a process which generates reactive intermediates and chromium(III). The metabolites ultimately bind to cellular constituents and may result in impairment of their normal function in the cell. In vitro, ascorbic acid (vitamin C) and the thiols, glutathione, cysteine, cysteamine, lipoic acid, coenzyme A, and coenzyme M reduce chrominum(VI) at a significant rate under physiological conditions. ... /Chromium (VI)/ [R5, 243]

PHCY:

----------PHARMACOLOGY CATEGORY (USE CODE ZPHC)----------

THER: *Chromium(VI) oxide has been used as a cauterizing agent, especially to stop nose bleeds. [R5, 242]

ENEX:

-----ENVIRONMENTAL FATE/EXPOSURE POTENTIAL CATEGORY (USE CODE ZENE)------

FATE: *The processes that control the environmental chemistry of chromium include redox transformation, precipitation/dissolution, and adsorption/desorption reactions. Commonly occurring reductants, such as ferrous iron and organic material, can transform chromium(VI) to chromium(III), but manganese oxides are the only inorganic oxidants found in the environment that cause the rapid oxidation of chromium(III) to chromium(VI). In the trivalent state, chromium readily forms compounds such as Cr(OH)3 and (Cr,Fe)(OH)3. These solids show amphoteric solubility behavior, with hydroxo complexes being the dominant aqueous species of chromium(III). The relatively low solubilities of Cr(OH)3 and (Cr,Fe)(OH)3 limit chromium(III) concentrations to less than the drinking water limit over much of the pH range of environmental interest. In the hexavalent state, the formation of the Ba(S,Cr)O4 solid solution controls the dissolved chromium concentrations in environments that contain barium sulfate. In the absence of solubility controlling chromium(VI) solids, chromium(VI) concentrations in acidic to slightly alkaline conditions are expected to be limited by adsorption. Iron oxides are the most important absorbents for aqueous chromium(VI) species in most soil environments. Although these processes are complex and interrelated, each must be considered to predict the aqueous concentrations, mobility, and toxicity of chromium in the environment. [R30]

RTEX: *Chromic acid ... can affect the body if they are inhaled or come in contact with the eyes or skin. They can also affect the body if they are swallowed. [R11]

*Skin problems caused by chromic acid are associated with chrome baths in the electroplating industry. /From table/ [R29, 532]

*Chromeplaters are exposed to chromium trioxide (CrO3) and its aqueous solution, chromic acid (H2CrO4). There is no convincing evidence that these highly corrosive soluble chromates pose a lung cancer risk among chrome plater, although the suggestion of an increased risk has been reported. Today, however, there are additives that reduce the escape of mist by reducing bubbling at electrodes, and newer plating methods, including electrolysis plating; and other

control measures have greatly reduced exposures to these chromates. [R29, 536]
EXSR:
-------EXPOSURE STANDARDS AND REGULATIONS CATEGORY (USE CODE ZEXS)-------
IDLH: *NIOSH has recommended that chromic acid be treated as a potential human carcinogen. [R7, 70]
OSHA: *Ceiling value: 1 mg/l cu m. /Transitional limits/ must continue to be achieved by any combination of engineering controls, work practices and personal protective equipment during the phase-in period, Sept 1 1989 through Dec 30, 1992. /Chromic acid and chromates, as Cr/ [R31]
*Ceiling value: 0.1 mg/cu m. /Final rule limits/ shall be achieved by any combination of engineering controls, work practices and personal protective equipment during the phase-in period, Sept 1, 1989 through Dec 30, 1992. Final rule limits become effective Dec 31, 1992. /Chromic acid and chromates, as Cr/ [R31]
NREC: *NIOSH recommends that chromic acid be regulated as a potential human carcinogen. [R7, 70]
*NIOSH usually recommends that occupational exposures to carcinogens be limited to the lowest feasible concn. [R7, 230]
*15 min Ceiling value: 0.001 mg/cu m /Chromic acid and chromates, as Cr/ [R7, 70]
TLV: +8 hr Time Weighted Avg (TWA) 0.05 mg/cu m (1994) / Water-soluble Chromium (VI) compounds, not otherwise classified/ [R22, 16]
+Excursion Limit Recommendation: Excursions in worker exposure levels may exceed three times the TLV-TWA for no more than a total of 30 min during a work day and under no circumstances should they exceed five times the TLV-TWA, provided that the TLV-TWA is not exceeded. /Water-soluble Chromium (VI) compounds not otherwise classified/ [R22, 5]
+BEI (Biological Exposure Index): Total chromium in urine, increase during shift, is 10 ug/g creatinine. The determinant is usually present in a significant amt in biological specimens collected from subjects who have not been occupationally exposed. Such background levels are incl in the BEI value. /Chromium (VI), water soluble fume/ [R22, 62]
+BEI (Biological Exposure Index): Total chromium in urine at end of shift at end of workweek is 30 ug/g creatinine. The determinant is usually present in a significant amt in biological specimens collected from subjects who have not been occupationally exposed. Such background levels are incl in the BEI value. /Chromium (VI), water soluble fume/ [R22, 62]
+A1. A1= Confirmed human carcinogen. (1994) /Water-soluble Cr VI compounds, not otherwise classified/ [R22, 17]
CERC: *Persons in charge of vessels or facilities are required to notify the National Response Center (NRC) immediately, when there is a release of this designated hazardous substance, in an amount equal to or greater than its reportable quantity of 10 lb or 4.54 kg. The toll free number of the NRC is (800) 424-8802; In the Washington D.C. metropolitan area (202) 426-2675. The rule for determining when notification is required is stated in 40 CFR 302.4 (section IV. D.3.b). [R32]
RCRA: *D007; A solid waste containing chromium may or may not become characterized as a hazardous waste when subjected to the Toxicity Characteristic Leaching Procedure listed in 40 CFR 261.24, and if so characterized, must be managed as a hazardous waste. /Chromium/ [R33]
FIFR: *Under section 3(c)(2)(b) of FIFRA, the Data Call-In Program, existing registrants are

required to provide EPA with needed studies. For chromic acid, used as a preservative, disinfectant, or slimicide, responses to the Data Call-In have been evaluated and a Chronic/Tox decision has been reached to defer the requirements to the standard. [R34]
*Under section 3(c)(2)(b) of FIFRA, the Data Call-In Program, existing registrants are required to provide EPA with needed studies. For chromic acid, responses to a comprehensive Data Call-In project involving pesticides for which Registeration standards have not been issued have been evaluated and a decision is pending. Responses are under review. [R35]
FDA: *Bottled water shall, when a composite of analytical units of equal volume from a sample is examined by the methods described in paragraph (d)(1)(ii) of this section, meet the standards of chemical quality and shall not contain chromium in excess of 0.05 mg/l. /Chromium/ [R36]
MAM:
--------MONITORING AND ANALYSIS METHODS CATEGORY (USE CODE ZMAM)---------
SAMP: *NIOSH Method 169. Analyte: Chromic acid mist. Matrix: Air. Procedure: Polyvinyl chloride filter-colorimetric. Flow Rate: 2 l/min. Sample Size: 100 liters. [R37,p. 169-1]
*NIOSH Method 152. Analyte: Total particulate chromium. Matrix: Air. Procedure: Atomic absorption. Flow Rate: is not given. Sample Size: 100 liters. [R37,p. 152-1]
ALAB: *NIOSH Method: 169. Analyte: Chromic acid mist. Matrix: Air. Procedure: Polyvinyl chloride filter. Precision (CVt): 4.3 RSD. Applicability: Under the conditions of sample size (100 l) the useful range is 0.004 to 0.2 mg chromium trioxide/cu m. Interference: Iron, copper, nickel, and vanadium. [R37,p. 169-1]
*NIOSH Method: 152. Analyte: Total particulate chromium. Matrix: Air. Procedure: Atomic absorption. Method Evaluation: Method validated over the range of 0.01 to greater than 0.4 mg/cu m using a 100 l sample. Method detection limit: is not given. Precision (CVt): less than 5% relative standard deviation. Interference: Iron and nickel. [R37,p. 152-1]
*The levels of trace element in hair of 9 yr old human subject was detn 50, 240, and 690 days after acute chromic acid poisoning (accidental immersion of 2 legs into dichromate waste). The half life of Cr in hair was 540 days. Significant decrease of Ca level and increase of Fe and Zn levels seen on day 54 restored to normal level on day 690. [R38]
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R18: 40 CFR 240-280, 300-306, 702-799 (7/1/90)
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