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COBALT CHLORIDE, HEXAHYDRATE
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MATERIAL SAFETY DATA SHEET

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SUBSTANCE IDENTIFICATION

SUBSTANCE: **COBALT CHLORIDE, HEXAHYDRATE**
CAS-NUMBER 7791-13-1

TRADE NAMES/SYNONYMS:
COBALT (2+) CHLORIDE HEXAHYDRATE; COBALT DICHLORIDE HEXAHYDRATE;
COBALT CHLORIDE, HEXAHYDRATE; C-371; COBALT(II) CHLORIDE HEXAHYDRATE;
COBALT THIOSULFATE; S79972; CL2COH12O6; ACC05345

CHEMICAL FAMILY:
INORGANIC SALT

MOLECULAR FORMULA: CL2-CO.6(H2-O)

MOLECULAR WEIGHT: 237.93

CERCLA RATINGS (SCALE 0-3): HEALTH-3 FIRE=0 REACTIVITY=0 PERSISTENCE=3
NFPA RATINGS (SCALE 0-4): HEALTH-2 FIRE=0 REACTIVITY=0

COMPONENTS AND CONTAMINANTS

COMPONENT: COBALT CHLORIDE, HEXAHYDRATE PERCENT: 100.0
CAS# 7791-13-1

OTHER CONTAMINANTS: NONE.

EXPOSURE LIMITS:
COBALT METAL, FUME AND DUST (AS CO):
0.05 MG/M3 OSHA TWA
0.02 MG/M3 ACGIH TWA (PROPOSED ADDITION 1992-93)
ACGIH A3-ANIMAL CARCINOGEN (PROPOSED ADDITION 1992-93)
0.05 MG/M3 NIOSH RECOMMENDED TWA

MEASUREMENT METHOD: PARTICULATE FILTER; ACID; ATOMIC ABSORPTION
SPECTROMETRY; (NIOSH VOL. III # 7027)

SUBJECT TO SARA SECTION 313 ANNUAL TOXIC CHEMICAL RELEASE REPORTING

**OSHA REVOKED THE FINAL RULE LIMITS OF JANUARY 19, 1989 IN RESPONSE TO THE
11TH CIRCUIT COURT OF APPEALS DECISION (AFL-CIO V. OSHA) EFFECTIVE
JUNE 30, 1993. SEE 29 CFR 1910.1000 (58 FR 35338)**

PHYSICAL DATA

DESCRIPTION: PINK TO RED, SLIGHTLY DELIQUESCENT, PRISMATIC CRYSTALLINE SOLID.

BOILING POINT: 1920 F (1049 C) (ANHYDROUS) MELTING POINT: 189 F (87 C)

SPECIFIC GRAVITY: 1.924 @ 25 C PH: 4.6 @ 0.2 M SOLN.

SOLUBILITY IN WATER: 77% @ 0 C

SOLVENT SOLUBILITY: SOLUBLE IN ALCOHOLS, ACETONE, ETHER, AND GLYCEROL.

LOSES WATER OF HYDRATION ABOVE 230 F (110 C).

FIRE AND EXPLOSION DATA

FIRE AND EXPLOSION HAZARD:
NEGLECTIBLE FIRE HAZARD WHEN EXPOSED TO HEAT OR FLAME.

FIREFIGHTING MEDIA:
DRY CHEMICAL, CARBON DIOXIDE, WATER SPRAY OR REGULAR FOAM
(1990 EMERGENCY RESPONSE GUIDEBOOK, DOT P 5800.5).

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FOR LARGER FIRES, USE WATER SPRAY, FOG OR REGULAR FOAM
(1990 EMERGENCY RESPONSE GUIDEBOOK, DOT P 5800.5).

FIREFIGHTING:
MOVE CONTAINER FROM FIRE AREA IF YOU CAN DO IT WITHOUT RISK. DO NOT SCATTER
SPILLED MATERIAL WITH HIGH-PRESSURE WATER STREAMS. DIKE FIRE-CONTROL WATER FOR
LATER DISPOSAL (1990 EMERGENCY RESPONSE GUIDEBOOK, DOT P 5800.5; GUIDE
PAGE 31).

USE AGENTS SUITABLE FOR TYPE OF SURROUNDING FIRE. AVOID BREATHING HAZARDOUS
VAPORS, KEEP UPWIND.

TOXICITY

COBALT CHLORIDE:
TOXICITY DATA:
ANHYDROUS: 48 MG/KG ORAL-CHILD TDLO; 1500 MG/KG ORAL-CHILD LDLO; 80 MG/KG
ORAL-RAT LD50; 80 MG/KG ORAL-MOUSE LD50; 55 MG/KG ORAL-GUINEA PIG LD50;
1272 MG/KG ORAL-RABBIT LDLO; 165 MG/KG SKIN-GUINEA PIG LDLO; 17402 UG/KG
INTRAPERITONEAL-RAT LD50; 49 MG/KG INTRAPERITONEAL-MOUSE LD50; 165 MG/KG
INTRAPERITONEAL-GUINEA PIG LDLO; 200 MG/KG SUBCUTANEOUS-RABBIT LDLO;
20 MG/KG INTRAVENOUS-RAT LD50; 36 INTRAVENOUS-DOG LDLO; MUTAGENIC DATA
(RTECS); REPRODUCTIVE EFFECTS DATA (RTECS); TUMORIGENIC DATA (RTECS).
DIHYDRATE: NO DATA AVAILABLE.
HEXAHYDRATE: 766 MG/KG ORAL-RAT LD50; 35 MG/KG INTRAPERITONEAL-RAT LD50;
90 MG/KG INTRAPERITONEAL-MOUSE LD50; 121 MG/KG SUBCUTANEOUS-RAT LDLO;
100 MG/KG SUBCUTANEOUS-MOUSE LDLO; 200 MG/KG SUBCUTANEOUS-RABBIT LDLO;
30300 UG/KG INTRAVENOUS-DOG LDLO; 25400 UG/KG INTRAVENOUS-RABBIT LDLO;
26 MG/KG INTRAVENOUS-GUINEA PIG LD50; REPRODUCTIVE EFFECTS DATA (RTECS).
CARCINOGEN STATUS: HUMAN INADEQUATE EVIDENCE, ANIMAL LIMITED EVIDENCE
(FOR COBALT(II) CHLORIDE) (IARC GROUP-2B FOR COBALT AND COBALT COMPOUNDS).
A SIGNIFICANT INCREASE IN THE RISK FOR LUNG CANCER WAS REPORTED AMONG
WORKERS IN COBALT PRODUCTION, WHO WERE ALSO EXPOSED TO NICKEL AND ARSENIC
AND HARD-METAL WORKERS WITH DOCUMENTED EXPOSURE TO COBALT-CONTAINING DUSTS.
A SIGNIFICANT INCREASE IN LUNG CANCER RISK WAS SEEN IN PEOPLE EXPOSED FOR
MORE THAN 10 YEARS WHOSE EXPOSURE HAD BEGUN MORE THAN 20 YEARS PREVIOUSLY.
A NUMBER OF SINGLE CASES OF MALIGNANT TUMORS, MOSTLY SARCOMAS, HAVE BEEN
REPORTED AT THE SITE OF ORTHOPEDIC IMPLANTS CONTAINING COBALT. REPEATED
SUBCUTANEOUS INJECTIONS OF COBALT(III) CHLORIDE IN RATS PRODUCED MANY LOCAL
AND A FEW DISTANT SUBCUTANEOUS SARCOMAS.
LOCAL EFFECTS: IRRITANT- INHALATION.
ACUTE TOXICITY LEVEL: TOXIC BY INGESTION (ANHYDROUS); MODERATELY TOXIC BY
INGESTION (HEXAHYDRATE).
TARGET EFFECTS: SENSITIZER- RESPIRATORY, DERMAL. POISONING MAY AFFECT THE
LIVER, KIDNEYS, AND BLOOD, AND THE RESPIRATORY, GASTROINTESTINAL,
CARDIOVASCULAR, ENDOCRINE AND NERVOUS SYSTEMS.

HEALTH EFFECTS AND FIRST AID

INHALATION:
COBALT CHLORIDE:
IRRITANT/SENSITIZER. 20 MG(CO)/M3 IMMEDIATELY DANGEROUS TO LIFE OR HEALTH.
ACUTE EXPOSURE- MAY CAUSE UPPER RESPIRATORY TRACT IRRITATION, RHINITIS,
AND TRACHEITIS. SENSITIZATION REACTIONS MAY OCCUR IN PREVIOUSLY EXPOSED
PERSONS. IN ANIMALS, INHALATION OF COBALT SALTS LEADS TO PULMONARY EDEMA.
CHRONIC EXPOSURE- REPEATED OR PROLONGED EXPOSURE MAY CAUSE RESPIRATORY
IRRITATION, EXTRINSIC ASTHMA, AND PNEUMONITIS. SYMPTOMS MAY
INCLUDE WHEEZING, NASAL OBSTRUCTION, SNEEZING, CLEAR SECRETIONS SOMETIMES
CONTAINING BLOOD, AN INTENSE BURNING SENSATION WHEN SWALLOWING, AND
EXERTIONAL DYSPNEA. OTHER SYMPTOMS MAY INCLUDE GASTROINTESTINAL DISTRESS,
APPETITE AND WEIGHT LOSS, HEADACHE, WEAKNESS, IRRITABILITY, PARTIAL OR
COMPLETE ANOSMIA, AUDITORY NERVE PROBLEMS, POLYCYTHEMIA, PERIPHERAL
NEURITIS, CHANGES IN ELECTRICAL ACTIVITY OF THE BRAIN, AND AN INCREASED
INCIDENCE OF SPONTANEOUS ABORTIONS IN WOMEN WORKERS AND IN THE WIVES OF
MEN WORKERS. FIBROTIC CHANGES OF THE LUNGS HAVE BEEN
ATTRIBUTED TO COBALT EVEN WHEN COBALT IS ASSOCIATED WITH HARD METALS.
SYMPTOMS MAY INCLUDE COUGH, SCANTY MUCCOID SPUTUM, AND SHORTNESS OF
BREATH WHICH PROGRESSIVELY WORSENS. TACHYPNEA, CLUBBING OF THE DIGITS,
AND BASAL CRACKLES ARE LATE FEATURES OF THIS CONDITION. PULMONARY
FUNCTION IS DECREASED AND DEATH IS USUALLY DUE TO PULMONARY HYPERTENSION
AND COR PULMONALE. SEVERAL CASES OF CARDIOMYOPATHY, AS DETAILED IN
CHRONIC INGESTION, HAVE BEEN REPORTED FROM OCCUPATIONAL EXPOSURE.

FIRST AID- REMOVE FROM EXPOSURE AREA TO FRESH AIR IMMEDIATELY. IF BREATHING
HAS STOPPED, PERFORM ARTIFICIAL RESPIRATION. KEEP PERSON WARM AND AT REST.
TREAT SYMPTOMATICALLY AND SUPPORTIVELY. GET MEDICAL ATTENTION IMMEDIATELY.

SKIN CONTACT:
COBALT CHLORIDE:
SENSITIZER.
ACUTE EXPOSURE- MAY CAUSE IRRITATION, REDNESS AND SENSITIZATION
DERMATITIS IN PREVIOUSLY EXPOSED PERSONS. BOTH URTICARIAL ERUPTIONS AND
ERYTHEMATOUS PAPULAR TYPES HAVE BEEN DESCRIBED AND USUALLY OCCUR IN SKIN
AREAS SUBJECTED TO FRICTION, SUCH AS THE ELBOW FLEXURES, ANKLES, AND NECK.
CHRONIC EXPOSURE- REPEATED OR PROLONGED CONTACT MAY RESULT IN SENSITIZATION
DERMATITIS.

FIRST AID- REMOVE CONTAMINATED CLOTHING AND SHOES IMMEDIATELY. WASH AFFECTED AREA WITH SOAP OR MILD DETERGENT AND LARGE AMOUNTS OF WATER UNTIL NO EVIDENCE OF CHEMICAL REMAINS (APPROXIMATELY 15-20 MINUTES). GET MEDICAL ATTENTION IMMEDIATELY.

EYE CONTACT:

COBALT CHLORIDE:

ACUTE EXPOSURE- DIRECT CONTACT MAY BE IRRITATING. WHEN A 0.1 M SOLUTION AT PH OF 5.8 WAS APPLIED TO THE CORNEAL STROMA OF RABBITS AFTER REMOVAL OF THE CORNEAL EPITHELIUM, COBALT CHLORIDE CAUSED A TOXIC REACTION OF PERMANENT DENSE OPACIFICATION AND VASCULARIZATION.
CHRONIC EXPOSURE- NO SPECIFIC DATA AVAILABLE. REPEATED OR PROLONGED CONTACT WITH COBALT COMPOUNDS MAY CAUSE CONJUNCTIVITIS.

FIRST AID- WASH EYES IMMEDIATELY WITH LARGE AMOUNTS OF WATER OR NORMAL SALINE, OCCASIONALLY LIFTING UPPER AND LOWER LIDS. UNTIL NO EVIDENCE OF CHEMICAL REMAINS (APPROXIMATELY 15-20 MINUTES). GET MEDICAL ATTENTION IMMEDIATELY.

INGESTION:

COBALT CHLORIDE:

TOXIC.

ACUTE EXPOSURE- THE LETHAL DOSE IN HUMANS IS ESTIMATED TO BE BETWEEN 50-500 MG/KG. SYMPTOMS MAY INCLUDE GASTROINTESTINAL IRRITATION, PAIN, VOMITING, DIARRHEA, VASODILATION OF FACE AND EARS, MILD HYPOTENSION, RASH, TINNITIS, NERVE DEAFNESS AND A SENSATION OF HOTNESS. A 19 MONTH OLD CHILD DIED 5 HOURS AFTER INGESTING 30 G OF A COBALT CHLORIDE SOLUTION. SYMPTOMS INCLUDED VOMITING, RESTLESSNESS, DROWSINESS, AND MARKED CYANOSIS OF THE LIPS AND OF THE NAIL BEDS.

CHRONIC EXPOSURE- CARDIOMYOPATHY HAS BEEN CAUSED BY EXCESSIVE INTAKE OF COBALT. SIGNS AND SYMPTOMS OF THIS ILLNESS INCLUDED GASTROINTESTINAL DISTURBANCES WITH NAUSEA, VOMITING AND DIARRHEA, SHORTNESS OF BREATH, DRY AND PERSISTENT COUGH, THORACIC AND RIGHT UPPER QUADRANT ABDOMINAL PAIN, ANKLE EDEMA, CYANOSIS, LOWERED BLOOD PRESSURE, HEART ENLARGEMENT, PERICARDIAL EFFUSION, RAPID HEART RATE, ELECTROCARDIOGRAPHIC ABNORMALITIES AND DEATH. SEQUELA INCLUDED RECURRENT CHRONIC HEART FAILURE, AND NEUROLOGIC AND MENTAL DETERIORATION. THERAPEUTIC ADMINISTRATION HAS CAUSED NAUSEA, VOMITING, SKIN RASH, TINNITUS, NERVE DEAFNESS, THYROID HYPERPLASIA, MYXEDEMA, POLYCYTHEMIA, PROLONGED BLOOD CLOTTING TIME, CARDIOMYOPATHY, AND DEATH. DEGENERATIVE CHANGES HAVE OCCURRED IN THE LIVER, KIDNEYS, AND PANCREAS OF ANIMALS. REPRODUCTIVE EFFECTS HAVE BEEN REPORTED IN ANIMALS.

FIRST AID- TREAT SYMPTOMATICALLY AND SUPPORTIVELY. GET MEDICAL ATTENTION IMMEDIATELY. IF VOMITING OCCURS, KEEP HEAD LOWER THAN HIPS TO PREVENT ASPIRATION.

ANTIDOTE:

THE FOLLOWING ANTIDOTE HAS BEEN RECOMMENDED. HOWEVER, THE DECISION AS TO WHETHER THE SEVERITY OF POISONING REQUIRES ADMINISTRATION OF ANY ANTIDOTE AND ACTUAL DOSE REQUIRED SHOULD BE MADE BY QUALIFIED MEDICAL PERSONNEL.

POISONING FROM COBALT COMPOUNDS:

GIVE CALCIUM DISODIUM EDETATE, AVAILABLE AS 5 ML AMPULES OF A 20% SOLUTION. GIVE 15-25 MG/KG (0.08-0.125 ML OF 20% SOLUTION PER KILOGRAM OF BODY WEIGHT) IN 250-500 ML OF 5% DEXTROSE INTRAVENOUSLY OVER A 1 TO 2 HOUR PERIOD. TWICE DAILY. THE MAXIMUM DOSE SHOULD NOT EXCEED 50 MG/KG/DAY. THE DRUG SHOULD BE GIVEN IN 5-DAY COURSES WITH A REST PERIOD OF AT LEAST 2 DAYS BETWEEN COURSES. AFTER THE FIRST COURSE, SUBSEQUENT COURSES SHOULD NOT EXCEED 50 MG/KG/DAY. DAILY URINALYSES SHOULD BE DONE DURING THE TREATMENT PERIOD. THE DOSAGE SHOULD BE REDUCED IF ANY UNUSUAL URINARY FINDINGS APPEAR. FOR INTRAMUSCULAR ADMINISTRATION, GIVE 20% SOLUTION (200 MG/ML), 12.5 MG/KG BODY WEIGHT EVERY 4-6 HOURS. DILUTE EACH DOSE WITH AN EQUAL VOLUME OF 1% PROCAINE. DOSE LIMITATION IS THE SAME AS THAT GIVEN ABOVE. FOR SEVERE INTOXICATIONS, SOME EXPERTS URGE SIMULTANEOUS ADMINISTRATION OF DIMERCAPROL DURING THE FIRST 48 HOURS OF TREATMENT (DREISBACH HANDBOOK OF POISONING, 12TH ED.). ANTIDOTE SHOULD BE ADMINISTERED BY QUALIFIED MEDICAL PERSONNEL. GET MEDICAL ATTENTION IMMEDIATELY.

REACTIVITY

REACTIVITY:

STABLE UNDER NORMAL TEMPERATURES AND PRESSURES.

INCOMPATIBILITIES:

COBALT CHLORIDE:

METALS: INCOMPATIBLE.
POTASSIUM: FORMS SHOCK SENSITIVE MIXTURE.
SODIUM: EXOTHERMIC REACTION.

DECOMPOSITION:

THERMAL DECOMPOSITION PRODUCTS MAY INCLUDE TOXIC OXIDES OF COBALT AND TOXIC AND CORROSIVE FUMES OF CHLORIDES.

POLYMERIZATION:

HAZARDOUS POLYMERIZATION HAS NOT BEEN REPORTED TO OCCUR UNDER NORMAL TEMPERATURES AND PRESSURES.

STORAGE AND DISPOSAL

OBSERVE ALL FEDERAL, STATE AND LOCAL REGULATIONS WHEN STORING OR DISPOSING OF THIS SUBSTANCE.

STORAGE

KEEP IN A TIGHTLY CLOSED CONTAINER. STORE IN A COOL, DRY, VENTILATED AREA.

STORE AWAY FROM INCOMPATIBLE SUBSTANCES.

CONDITIONS TO AVOID

MAY BURN BUT DOES NOT IGNITE READILY. AVOID CONTACT WITH STRONG OXIDIZERS, EXCESSIVE HEAT, SPARKS, OR OPEN FLAME.

SPILL AND LEAK PROCEDURES

OCCUPATIONAL SPILL:

SWEEP UP AND PLACE IN SUITABLE CLEAN, DRY CONTAINERS FOR RECLAMATION OR LATER DISPOSAL. DO NOT FLUSH SPILLED MATERIAL INTO SEWER. KEEP UNNECESSARY PEOPLE AWAY.

PROTECTIVE EQUIPMENT

VENTILATION:

PROVIDE LOCAL EXHAUST OR PROCESS ENCLOSURE VENTILATION TO MEET PUBLISHED EXPOSURE LIMITS.

RESPIRATOR:

THE FOLLOWING RESPIRATORS AND MAXIMUM USE CONCENTRATIONS ARE RECOMMENDATIONS BY THE U.S. DEPARTMENT OF HEALTH AND HUMAN SERVICES, NIOSH POCKET GUIDE TO CHEMICAL HAZARDS, NIOSH CRITERIA DOCUMENTS OR BY THE U.S. DEPARTMENT OF LABOR, 29 CFR 1910 SUBPART Z.
THE SPECIFIC RESPIRATOR SELECTED MUST BE BASED ON CONTAMINATION LEVELS FOUND IN THE WORK PLACE, MUST NOT EXCEED THE WORKING LIMITS OF THE RESPIRATOR AND BE JOINTLY APPROVED BY THE NATIONAL INSTITUTE FOR OCCUPATIONAL SAFETY AND HEALTH AND THE MINE SAFETY AND HEALTH ADMINISTRATION (NIOSH-MSHA).

COBALT:

0.25 MG(CO)/M3- ANY DUST AND MIST RESPIRATOR.

0.5 MG(CO)/M3- ANY DUST AND MIST RESPIRATOR EXCEPT SINGLE-USE AND QUARTER-MASK RESPIRATORS.
ANY DUST, MIST, AND FUME RESPIRATOR.
ANY SUPPLIED-AIR RESPIRATOR.
ANY SELF-CONTAINED BREATHING APPARATUS.

1.25 MG(CO)/M3- ANY POWERED, AIR-PURIFYING RESPIRATOR WITH A DUST AND MIST FILTER.
ANY SUPPLIED-AIR RESPIRATOR OPERATED IN A CONTINUOUS-FLOW MODE.
ANY POWERED, AIR-PURIFYING RESPIRATOR WITH A DUST, MIST, AND FUME FILTER.

2.5 MG(CO)/M3- ANY AIR-PURIFYING, FULL-FACEPIECE RESPIRATOR WITH A HIGH-EFFICIENCY PARTICULATE FILTER.
ANY SELF-CONTAINED BREATHING APPARATUS WITH A FULL FACEPIECE.
ANY SUPPLIED-AIR RESPIRATOR WITH A FULL FACEPIECE.

20 MG(CO)/M3- ANY SUPPLIED-AIR RESPIRATOR THAT HAS A FULL FACEPIECE AND IS OPERATED IN A PRESSURE-DEMAND OR OTHER POSITIVE-PRESSURE MODE

ESCAPE- ANY AIR-PURIFYING, FULL-FACEPIECE RESPIRATOR WITH A HIGH-EFFICIENCY PARTICULATE FILTER.
ANY APPROPRIATE ESCAPE-TYPE SELF-CONTAINED BREATHING APPARATUS.

FOR FIREFIGHTING AND OTHER IMMEDIATELY DANGEROUS TO LIFE OR HEALTH CONDITIONS:

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 THAT HAS A FULL FACEPIECE AND IS OPERATED IN A 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.

CLOTHING:

EMPLOYEE MUST WEAR APPROPRIATE PROTECTIVE (IMPERVIOUS) CLOTHING AND EQUIPMENT TO PREVENT REPEATED OR PROLONGED SKIN CONTACT WITH THIS SUBSTANCE.

GLOVES:

EMPLOYEE MUST WEAR APPROPRIATE PROTECTIVE GLOVES TO PREVENT CONTACT WITH THIS SUBSTANCE.

EYE PROTECTION:

EMPLOYEE MUST WEAR SPLASH-PROOF OR DUST-RESISTANT SAFETY GOGGLES TO PREVENT

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EYE CONTACT WITH THIS SUBSTANCE.

EMERGENCY EYE WASH: WHERE THERE IS ANY POSSIBILITY THAT AN EMPLOYEE'S EYES MAY BE EXPOSED TO THIS SUBSTANCE, THE EMPLOYER SHOULD PROVIDE AN EYE WASH FOUNTAIN WITHIN THE IMMEDIATE WORK AREA FOR EMERGENCY USE.

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