Reactive red 2

sc-215800

Material Safety Data Sheet

Hazard Alert Code Key:	EXTREME	HIGH	MODERATE	LOW

Section 1 - CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

PRODUCT NAME
Reactive red 2

STATEMENT OF HAZARDOUS NATURE
CONSIDERED A HAZARDOUS SUBSTANCE ACCORDING TO OSHA 29 CFR 1910.1200.

NFPA

SUPPLIER
Company: Santa Cruz Biotechnology, Inc.
Address:
2145 Delaware Ave
Santa Cruz, CA 95060
Telephone: 800.457.3801 or 831.457.3800
Emergency Tel: CHEMWATCH: From within the US and Canada: 877-715-9305
Emergency Tel: From outside the US and Canada: +800 2436 2255 (1-800-CHEMCALL) or call +613 9573 3112

PRODUCT USE
■ Reactive dyes encompass azo dyes, which form covalent bonds with the fibres they colour, e.g. cotton, rayon, cotton, wool silk and nylon. The dye molecule contains specific functional groups, which can undergo addition or substitution reactions with the -OH, -SH and -NH2 groups present in the fibres. Due to very good fastness of the substrate, the reactive dyes are one of the most important group of dyes for colouring of textiles.

SYNONYMS
C19-H10-Cl2-N6-O7-S2.Na2, "2, 7-naphthalenedisulfonic acid, ", "2, 7-naphthalenedisulfonic acid, ", "5-((4, 6-dichloro-s-triazin-2-yl)amino)-4-hydroxy-3-(phenylazo)-, ", "disodium salt", "5-((4, 6-dichloro-s-triazin-2-yl)amino)-4-hydroxy-3-(phenylazo)-, ", "disodium salt", "5-[(4, 6-dichloro-1, 3, 5-triazin-2-yl)amino]-4-hydroxy-3-(phenylazo)-", "2, 7-naphthalenedisulfonic acid, disodium salt", "5-[(4, 6-dichloro-1, 3, 5-triazin-2-yl)amino]-4-hydroxy-3-(phenylazo)-", "2, 7-naphthalenedisulfonic acid, disodium salt", "2, 7-naphthalenedisulfonic acid, 4-[(4, 6-dichloro-1, 3, 5-triazin-2-", "yl)amino]-5-hydroxy-6-(phenylazo)-, disodium salt", "2, 7-naphthalenedisulfonic acid, 4-[(4, 6-dichloro-1, 3, 5-triazin-2-", "yl)amino]-5-hydroxy-6-(phenylazo)-, disodium salt", "Brilliant Red 5SKH", "Cerven Reaktivni 2", "Chemictive Brilliant Red 5B", "Mikacion Brilliant red 5BS", "Ostazin Brilliant Red S 5B", "Procion Brilliant Rec M 5B", "Reactive Brilliant Red 5SHK"

Section 2 - HAZARDS IDENTIFICATION

CANADIAN WHMIS SYMBOLS

EMERGENCY OVERVIEW
RISK
Irritating to eyes.
May cause CANCER.
May cause SENSITIZATION by inhalation and skin contact.

POTENTIAL HEALTH EFFECTS

ACUTE HEALTH EFFECTS

SWALLOWED
■ Although ingestion is not thought to produce harmful effects, the material may still be damaging to the health of the individual following ingestion, especially where pre-existing organ (e.g. liver, kidney) damage is evident. Present definitions of harmful or toxic substances are generally based on doses producing mortality (death) rather than those producing morbidity (disease, ill-health). Gastrointestinal tract discomfort may produce nausea and vomiting. In an occupational setting however,

ingestion of insignificant quantities is not thought to be cause for concern.

EYE

■ This material may produce eye irritation in some persons and produce eye damage 24 hours or more after instillation. Moderate inflammation may be expected with redness; conjunctivitis may occur with prolonged exposure.

SKIN

■ The material is not thought to produce adverse health effects or skin irritation following contact (as classified using animal models). Nevertheless, good hygiene practice requires that exposure be kept to a minimum and that suitable gloves be used in an occupational setting.
■ Open cuts, abraded or irritated skin should not be exposed to this material.
■ Entry into the blood-stream, through, for example, cuts, abrasions or lesions, may produce systemic injury with harmful effects. Examine the skin prior to the use of the material and ensure that any external damage is suitably protected.

INHALED

■ The material is not thought to produce adverse health effects or irritation of the respiratory tract (as classified using animal models). Nevertheless, good hygiene practice requires that exposure be kept to a minimum and that suitable control measures be used in an occupational setting.
■ Persons with impaired respiratory function, airway diseases and conditions such as emphysema or chronic bronchitis, may incur further disability if excessive concentrations of particulate are inhaled.

CHRONIC HEALTH EFFECTS

■ Inhaling this product is more likely to cause a sensitization reaction in some persons compared to the general population.
Skin contact with the material is more likely to cause a sensitization reaction in some persons compared to the general population.
There is ample evidence that this material can be regarded as being able to cause cancer in humans based on experiments and other information.
Occupational exposure to reactive dyes may result in irritation of the respiratory tract, when inhaled in the dust form.
Long term exposure to high dust concentrations may cause changes in lung function i.e. pneumoconiosis; caused by particles less than 0.5 micron penetrating and remaining in the lung. Prime symptom is breathlessness; lung shadows show on X-ray.
Azo dyes as a class are a concern for their potential induction of mutagenicity and carcinogenicity
Reductive cleavage or degradation into component aromatic amines is one of the mechanisms leading to the genotoxicity of azo dyes. The aromatic amines that arise from the azo reduction and cleavage of azo dyes are thought to be activated as mutagens through their N-oxidation by cytochrome P450 isozymes. The N-hydroxylarylamines that are formed may be further glucuronated (activated) or acetylated (inactivated), which may influence their mutagenicity. Under acidic pH, they form reactive nitrenium ions that can alkylate bases in DNA, particularly the nucleophilic centres in guanine. This mechanism is thought to contribute to the carcinogenicity of many azo dyes, and as a result, azo dyes should be assessed for
toxicity and classified similarly to their component amines.
Many azo dyes (aromatic amines) have been found to be carcinogenic in laboratory animals, affecting the liver, urinary bladder and intestines. Specific toxicity effects in humans have not been established but some dyes are known to be mutagenic. Benzidine and its metabolic derivatives have been detected in the urine of workers exposed to Direct azo dyes. An epidemiological study of silk dyers and painters with multiple exposures to benzidine based and other dyes indicate a strong association with bladder cancer.
Not all azo dyes are genotoxic, only those dyes that contain either phenylenediamine or benzidine in the molecule would become mutagenic. Therefore, phenylenediamine and benzidine are the major mutagenic moieties of carcinogenic azo dyes. Many functional groups (i.e. NO2, CH3 and NH2) within the molecules of these amines affected their genotoxicities. Many aromatic amines are carcinogenic and/or mutagenic. This appears to involve bioactivation by various organs and/ or bacterial intervention
The simplest azo dyes, which raise concern, have an exocyclic amino-group that is the key to any carcinogenicity for it is this group which undergoes biochemical N-oxidation and further reaction to reactive electrophiles. The DNA adducts formed by covalent binding through activated nitrogen have been identified. However not all azo compounds possess this activity and delicate alterations to structure vary the potential of carcinogenicity / acid, reduces or eliminates the effect. Complex azo dyes consisting of more than one azo (N=N) linkage may be metabolised to produce complexed carcinogenic aromatic amines such as benzidine.
The carcinogenic aromatic amines are generally recognized to be bioactivated in two steps: N-hydroxylation catalyzed by cytochrome P450 enzymes to give N-hydroxyarylamines and subsequent acetyl-CoA-dependent o-acetylation. The N-acetoxy esters formed by acetylation of hydroxylamines are reactive electrophiles which give rise to covalent DNA-adduct probably via the loss of an active anion, which yields a nitrenium ion.
In the past, azo colorants based on benzidine, 3,3'-dichlorobenzidine, 3,3'-dimethylbenzidine (o-tolidine), and 3,3'-dimethoxybenzidine (o-dianisidine) have been synthesized in large amounts and numbers. Studies in exposed workers have demonstrated that the azoreduction of benzidine-based dyes occurs in man. The metabolic conversion of benzidine-, 3,3'-dimethylbenzidine- and 3,3'-dimethoxybenzidine-based dyes to their (carcinogenic) amine precursors in vivo is a general phenomenon that must be considered for each member of this class of chemicals.
Azo dyes containing phenylenediamine are mutagenic in certain assays most likely due to the formation of oxidized p-phenylenediamine. p-Phenylenediamine are oxidised by the liver microsomal enzymes (S9). Pure p-phenylenediamine is non-mutagenic but becomes mutagenic after it is oxidized. Modification of the moieties that can be metabolized to p-phenylenediamine by sulfonation, carboxylation or copper complexation eliminated the mutagenic responses.
Bioavailability of azo dyes also determines whether they are to be metabolically converted to carcinogens. As a majority of azo pigments are based on 3,3'-dichlorobenzidine, much of the available experimental data are focused on this group. Long-term animal carcinogenicity studies performed with pigments based on 3,3'-dichlorobenzidine did not show a carcinogenic effect. Hence, it is very unlikely that occupational exposure to insoluble azo pigments would be associated with a substantial risk of (bladder) cancer in man. According to current EU regulations, azo dyes based on benzidine, 3,3'-dimethoxybenzidine and 3,3'-dimethylbenzidine have been classified as carcinogens of category 2 as “substances which should be regarded as if they are carcinogenic to man” This is not the case for 3,3'-dichlorobenzidine-based azo pigments.
It is also postulated that some of the aromatic amines metabolically produced from azo dyes may be responsible for the induction of autoimmune diseases such as lupus. This is probably due to the fact that lupus inducing drugs are amines in nature. They also have the similar metabolic activation pathways as the human bladder procarcinogens. The only difference between lupus inducing drugs and procarcinogens is that carcinogens interact with DNA to form covalent adducts which produce mutations, while lupus inducing drugs interact with DNA to provoke the immunoresponses.
Azo dyes are widely used in industry. A large amount of these dyes are discharged into streams and rivers, and they are considered as an environmental pollutant. Some of these compounds may accumulate into food chains and eventually reach the human body through ingestion. Intestinal microbiota and to a lesser extent, the liver enzymes, are responsible for the cleavage of azo dyes into aromatic amines. Some of human endogenous bacteria that contaminate bladder can metabolically activate aromatic amines that are produced from azo dyes (procarcinogens). The addition of the nitro-group to these aromatic amines would convert them into direct mutagens.
These findings may also explain, partly, the close relationships between chronic infection and cancer development.
Skin bacteria are thought to be responsible for cleavage of certain azo dyes to produce carcinogens; of importance are dye-stuffs found in cosmetics, hair dyes, textiles and tattoo inks .
Several in vitro and in vivo studies suggest that certain azo dyes may be reductively cleaved when applied to the skin also under aerobic conditions. Results obtained with the various azo dyes suggest that reductive cleavage to aromatic amines has to be considered a significant degradation pathway. It is generally thought that about 30% of the dye may be cleaved in this manner.
From the available literature, on this chemical class of azo dyes, it can be deduced that all azo dyes which are split into carcinogenic arylamines are possible carcinogens.

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Both water-soluble and lipophilic azo dyes of this class have been shown experimentally to undergo cleavage to potential carcinogens.

Section 3 - COMPOSITION / INFORMATION ON INGREDIENTS

HAZARD RATINGS

		Min	Max
Flammability:	1		
Toxicity:	0		
Body Contact:	2		
Reactivity:	1		
Chronic:	3		

Min/Nil=0
Low=1
Moderate=2
High=3
Extreme=4

NAME	CAS RN	%
C.I. Reactive Red 2	17804-49-8	>98

Section 4 - FIRST AID MEASURES

SWALLOWED

■
- Immediately give a glass of water.
- First aid is not generally required. If in doubt, contact a Poisons Information Center or a doctor.

EYE

■ If this product comes in contact with the eyes:
- Wash out immediately with fresh running water.
- Ensure complete irrigation of the eye by keeping eyelids apart and away from eye and moving the eyelids by occasionally lifting the upper and lower lids.
- If pain persists or recurs seek medical attention.
- Removal of contact lenses after an eye injury should only be undertaken by skilled personnel.

SKIN

■ If skin contact occurs:
- Immediately remove all contaminated clothing, including footwear
- Flush skin and hair with running water (and soap if available).
- Seek medical attention in event of irritation.

INHALED

■
- If dust is inhaled, remove from contaminated area.
- Encourage patient to blow nose to ensure clear passage of breathing.
- If irritation or discomfort persists seek medical attention.

NOTES TO PHYSICIAN

■ Treat symptomatically.
Periodic medical surveillance should be carried out on persons in occupations exposed to the manufacture or bulk handling of the product and this should include hepatic function tests and urinalysis examination. [ILO Encyclopaedia].

Section 5 - FIRE FIGHTING MEASURES

Vapour Pressure (mmHG):	Negligible
Upper Explosive Limit (%):	Not available.
Specific Gravity (water=1):	Not available
Lower Explosive Limit (%):	Not available

EXTINGUISHING MEDIA

■
- Foam.
- Dry chemical powder.
- BCF (where regulations permit).
- Carbon dioxide.
- Water spray or fog - Large fires only.

FIRE FIGHTING

■
- Alert Emergency Responders and tell them location and nature of hazard.
- Wear breathing apparatus plus protective gloves.

Hazard Alert Code Key:	EXTREME	HIGH	MODERATE	LOW

- Prevent, by any means available, spillage from entering drains or water course.
- Use water delivered as a fine spray to control fire and cool adjacent area.
- DO NOT approach containers suspected to be hot.
- Cool fire exposed containers with water spray from a protected location.
- If safe to do so, remove containers from path of fire.
- Equipment should be thoroughly decontaminated after use.

GENERAL FIRE HAZARDS/HAZARDOUS COMBUSTIBLE PRODUCTS

■

- Combustible solid which burns but propagates flame with difficulty.
- Avoid generating dust, particularly clouds of dust in a confined or unventilated space as dusts may form an explosive mixture with air, and any source of ignition, i.e. flame or spark, will cause fire or explosion. Dust clouds generated by the fine grinding of the solid are a particular hazard; accumulations of fine dust may burn rapidly and fiercely if ignited.
- Dry dust can be charged electrostatically by turbulence, pneumatic transport, pouring, in exhaust ducts and during transport.
- Build-up of electrostatic charge may be prevented by bonding and grounding.
- Powder handling equipment such as dust collectors, dryers and mills may require additional protection measures such as explosion venting.

Combustion products include: carbon monoxide (CO), carbon dioxide (CO_2), nitrogen oxides (NOx), sulfur oxides (SOx), other pyrolysis products typical of burning organic material.
May emit poisonous fumes.
May emit corrosive fumes.

FIRE INCOMPATIBILITY

■ Avoid contamination with oxidizing agents i.e. nitrates, oxidizing acids,chlorine bleaches, pool chlorine etc. as ignition may result.

PERSONAL PROTECTION

Glasses:
Safety Glasses.
Chemical goggles.
Gloves:
Respirator:
Particulate

Section 6 - ACCIDENTAL RELEASE MEASURES

MINOR SPILLS

■

- Clean up waste regularly and abnormal spills immediately.
- Avoid breathing dust and contact with skin and eyes.
- Wear protective clothing, gloves, safety glasses and dust respirator.
- Use dry clean up procedures and avoid generating dust.
- Vacuum up or sweep up. NOTE: Vacuum cleaner must be fitted with an exhaust micro filter (HEPA type) (consider explosion-proof machines designed to be grounded during storage and use).
- Dampen with water to prevent dusting before sweeping.
- Place in suitable containers for disposal.

MAJOR SPILLS

■

- Clear area of personnel and move upwind.
- Alert Emergency Responders and tell them location and nature of hazard.
- Wear full body protective clothing with breathing apparatus.
- Prevent, by all means available, spillage from entering drains or water courses.
- Consider evacuation (or protect in place).
- No smoking, naked lights or ignition sources.
- Increase ventilation.
- Stop leak if safe to do so.
- Water spray or fog may be used to disperse / absorb vapour.
- Contain or absorb spill with sand, earth or vermiculite.
- Collect recoverable product into labelled containers for recycling.
- Collect solid residues and seal in labelled drums for disposal.
- Wash area and prevent runoff into drains.
- After clean up operations, decontaminate and launder all protective clothing and equipment before storing and re-using.
- If contamination of drains or waterways occurs, advise emergency services.

ACUTE EXPOSURE GUIDELINE LEVELS (AEGL) (in ppm)

AEGL 1: The airborne concentration of a substance above which it is predicted that the general population, including susceptible individuals, could experience notable discomfort, irritation, or certain asymptomatic nonsensory effects. However, the effects are not disabling and are transient and reversible upon cessation of exposure.
AEGL 2: The airborne concentration of a substance above which it is predicted that the general population, including susceptible individuals, could experience irreversible or other serious, long-lasting adverse health effects

or an impaired ability to escape.
AEGL 3: The airborne concentration of a substance above which it is predicted that the general population, including susceptible individuals, could experience life-threatening health effects or death.

Section 7 - HANDLING AND STORAGE

PROCEDURE FOR HANDLING

■

- Avoid all personal contact, including inhalation.
- Wear protective clothing when risk of exposure occurs.
- Use in a well-ventilated area.
- Prevent concentration in hollows and sumps.
- DO NOT enter confined spaces until atmosphere has been checked.
- DO NOT allow material to contact humans, exposed food or food utensils.
- Avoid contact with incompatible materials.
- When handling, DO NOT eat, drink or smoke.
- Keep containers securely sealed when not in use.
- Avoid physical damage to containers.
- Always wash hands with soap and water after handling.
- Work clothes should be laundered separately.
- Launder contaminated clothing before re-use.
- Use good occupational work practice.
- Observe manufacturer's storing and handling recommendations.
- Atmosphere should be regularly checked against established exposure standards to ensure safe working conditions are maintained.

Empty containers may contain residual dust which has the potential to accumulate following settling. Such dusts may explode in the presence of an appropriate ignition source.

- Do NOT cut, drill, grind or weld such containers.
- In addition ensure such activity is not performed near full, partially empty or empty containers without appropriate workplace safety authorisation or permit.

RECOMMENDED STORAGE METHODS

■

- Polyethylene or polypropylene container.
- Check all containers are clearly labelled and free from leaks.

STORAGE REQUIREMENTS

■

- Store in original containers.
- Keep containers securely sealed.
- Store in a cool, dry, well-ventilated area.
- Store away from incompatible materials and foodstuff containers.
- Protect containers against physical damage and check regularly for leaks.
- Observe manufacturer's storing and handling recommendations.

SAFE STORAGE WITH OTHER CLASSIFIED CHEMICALS

X X + X X +

X: Must not be stored together
O: May be stored together with specific preventions
+: May be stored together

Section 8 - EXPOSURE CONTROLS / PERSONAL PROTECTION

EXPOSURE CONTROLS

Source	Material	TWA ppm	TWA mg/m³	STEL ppm	STEL mg/m³	Peak ppm	Peak mg/m³	TWA F/CC	Notes
US - Oregon Permissible Exposure Limits (Z3)	C.I. Reactive Red 2 (Inert or Nuisance Dust: (d) Total dust)		10						*
US OSHA Permissible Exposure Levels (PELs) - Table Z3	C.I. Reactive Red 2 (Inert or Nuisance Dust: (d) Respirable fraction)		5						

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US OSHA Permissible Exposure Levels (PELs) - Table Z3	C.I. Reactive Red 2 (Inert or Nuisance Dust: (d) Total dust)	15	
US - Hawaii Air Contaminant Limits	C.I. Reactive Red 2 (Particulates not other wise regulated - Total dust)	10	
US - Hawaii Air Contaminant Limits	C.I. Reactive Red 2 (Particulates not other wise regulated - Respirable fraction)	5	
US - Oregon Permissible Exposure Limits (Z3)	C.I. Reactive Red 2 (Inert or Nuisance Dust: (d) Respirable fraction)	5	*
US - Tennessee Occupational Exposure Limits - Limits For Air Contaminants	C.I. Reactive Red 2 (Particulates not otherwise regulated Respirable fraction)	5	
US - Wyoming Toxic and Hazardous Substances Table Z1 Limits for Air Contaminants	C.I. Reactive Red 2 (Particulates not otherwise regulated (PNOR)(f)- Respirable fraction)	5	
US - Michigan Exposure Limits for Air Contaminants	C.I. Reactive Red 2 (Particulates not otherwise regulated, Respirable dust)	5	

MATERIAL DATA

C.I. REACTIVE RED 2:

■ Sensory irritants are chemicals that produce temporary and undesirable side-effects on the eyes, nose or throat. Historically occupational exposure standards for these irritants have been based on observation of workers' responses to various airborne concentrations. Present day expectations require that nearly every individual should be protected against even minor sensory irritation and exposure standards are established using uncertainty factors or safety factors of 5 to 10 or more. On occasion animal no-observable-effect-levels (NOEL) are used to determine these limits where human results are unavailable. An additional approach, typically used by the TLV committee (USA) in determining respiratory standards for this group of chemicals, has been to assign ceiling values (TLV C) to rapidly acting irritants and to assign short-term exposure limits (TLV STELs) when the weight of evidence from irritation, bioaccumulation and other endpoints combine to warrant such a limit. In contrast the MAK Commission (Germany) uses a five-category system based on intensive odour, local irritation, and elimination half-life. However this system is being replaced to be consistent with the European Union (EU) Scientific Committee for Occupational Exposure Limits (SCOEL); this is more closely allied to that of the USA.

OSHA (USA) concluded that exposure to sensory irritants can:

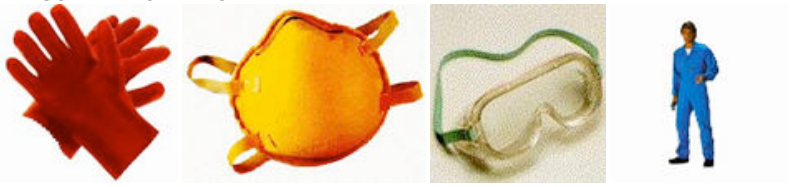
- cause inflammation
- cause increased susceptibility to other irritants and infectious agents
- lead to permanent injury or dysfunction
- permit greater absorption of hazardous substances and
- acclimate the worker to the irritant warning properties of these substances thus increasing the risk of overexposure.

It is the goal of the ACGIH (and other Agencies) to recommend TLVs (or their equivalent) for all substances for which there is evidence of health effects at airborne concentrations encountered in the workplace.

At this time no TLV has been established, even though this material may produce adverse health effects (as evidenced in animal experiments or clinical experience). Airborne concentrations must be maintained as low as is practically possible and occupational exposure must be kept to a minimum.

NOTE: The ACGIH occupational exposure standard for Particles Not Otherwise Specified (P.N.O.S) does NOT apply.

PERSONAL PROTECTION



Consult your EHS staff for recommendations

EYE

■

- Safety glasses with side shields.
- Chemical goggles.
- Contact lenses pose a special hazard; soft lenses may absorb irritants and all lenses concentrate them. DO NOT wear contact lenses.

HANDS/FEET

■ NOTE: The material may produce skin sensitization in predisposed individuals. Care must be taken, when removing gloves and other protective equipment, to avoid all possible skin contact.

Suitability and durability of glove type is dependent on usage. Important factors in the selection of gloves include: such as:

- frequency and duration of contact,
- chemical resistance of glove material,
- glove thickness and
- dexterity

Select gloves tested to a relevant standard (e.g. Europe EN 374, US F739).

- When prolonged or frequently repeated contact may occur, a glove with a protection class of 5 or higher (breakthrough time greater than 240 minutes according to EN 374) is recommended.
- When only brief contact is expected, a glove with a protection class of 3 or higher (breakthrough time greater than 60 minutes according to EN 374) is recommended.
- Contaminated gloves should be replaced.

Gloves must only be worn on clean hands. After using gloves, hands should be washed and dried thoroughly. Application of a non-perfumed moisturiser is recommended.

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Experience indicates that the following polymers are suitable as glove materials for protection against undissolved, dry solids, where abrasive particles are not present.

- polychloroprene
- nitrile rubber
- butyl rubber
- fluorocaoutchouc
- polyvinyl chloride

Gloves should be examined for wear and/ or degradation constantly.

OTHER

■

- Employees working with confirmed human carcinogens should be provided with, and be required to wear, clean, full body protective clothing (smocks, coveralls, or long-sleeved shirt and pants), shoe covers and gloves prior to entering the regulated area.
- Employees engaged in handling operations involving carcinogens should be provided with, and required to wear and use half-face filter-type respirators with filters for dusts, mists and fumes, or air purifying canisters or cartridges. A respirator affording higher levels of protection may be substituted.
- Emergency deluge showers and eyewash fountains, supplied with potable water, should be located near, within sight of, and on the same level with locations where direct exposure is likely.
- Prior to each exit from an area containing confirmed human carcinogens, employees should be required to remove and leave protective clothing and equipment at the point of exit and at the last exit of the day, to place used clothing and equipment in impervious containers at the point of exit for purposes of decontamination or disposal. The contents of such impervious containers must be identified with suitable labels. For maintenance and decontamination activities, authorized employees entering the area should be provided with and required to wear clean, impervious garments, including gloves, boots and continuous-air supplied hood.
- Prior to removing protective garments the employee should undergo decontamination and be required to shower upon removal of the garments and hood.
- Overalls.
- P.V.C. apron.
- Barrier cream.
- Skin cleansing cream.
- Eye wash unit.

■

- Respirators may be necessary when engineering and administrative controls do not adequately prevent exposures.
- The decision to use respiratory protection should be based on professional judgment that takes into account toxicity information, exposure measurement data, and frequency and likelihood of the worker's exposure - ensure users are not subject to high thermal loads which may result in heat stress or distress due to personal protective equipment (powered, positive flow, full face apparatus may be an option).
- Published occupational exposure limits, where they exist, will assist in determining the adequacy of the selected respiratory . These may be government mandated or vendor recommended.
- Certified respirators will be useful for protecting workers from inhalation of particulates when properly selected and fit tested as part of a complete respiratory protection program.
- Use approved positive flow mask if significant quantities of dust becomes airborne.
- Try to avoid creating dust conditions.

RESPIRATOR

■

Protection Factor	Half-Face Respirator	Full-Face Respirator	Powered Air Respirator
10 x PEL	P1	-	PAPR-P1
	Air-line*	-	-
50 x PEL	Air-line**	P2	PAPR-P2
100 x PEL	-	P3	-
		Air-line*	-
100+ x PEL	-	Air-line**	PAPR-P3

* - Negative pressure demand ** - Continuous flow

Explanation of Respirator Codes:
Class 1 low to medium absorption capacity filters.
Class 2 medium absorption capacity filters.
Class 3 high absorption capacity filters.
PAPR Powered Air Purifying Respirator (positive pressure) cartridge.
Type A for use against certain organic gases and vapors.
Type AX for use against low boiling point organic compounds (less than 65ºC).
Type B for use against certain inorganic gases and other acid gases and vapors.
Type E for use against sulfur dioxide and other acid gases and vapors.
Type K for use against ammonia and organic ammonia derivatives
Class P1 intended for use against mechanically generated particulates of sizes most commonly encountered in industry, e.g. asbestos, silica.
Class P2 intended for use against both mechanically and thermally generated particulates, e.g. metal fume.
Class P3 intended for use against all particulates containing highly toxic materials, e.g. beryllium.
The local concentration of material, quantity and conditions of use determine the type of personal protective equipment required.
Use appropriate NIOSH-certified respirator based on informed professional judgement. In conditions where no reasonable estimate of exposure can be made, assume the exposure is in a concentration IDLH and use NIOSH-certified full face pressure demand SCBA with a minimum service life of 30 minutes, or a combination full facepiece pressure demand SAR with auxiliary self-contained air supply. Respirators provided only for escape from IDLH atmospheres shall be NIOSH-certified for escape from the atmosphere in which they will be used.

ENGINEERING CONTROLS

■

- Employees exposed to confirmed human carcinogens should be authorized to do so by the employer, and work in a regulated area.
- Work should be undertaken in an isolated system such as a "glove-box" . Employees should wash their hands and arms upon completion of the assigned task and before engaging in other activities not associated with the isolated system.

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- Within regulated areas, the carcinogen should be stored in sealed containers, or enclosed in a closed system, including piping systems, with any sample ports or openings closed while the carcinogens are contained within.
- Open-vessel systems are prohibited.
- Each operation should be provided with continuous local exhaust ventilation so that air movement is always from ordinary work areas to the operation.
- Exhaust air should not be discharged to regulated areas, non-regulated areas or the external environment unless decontaminated. Clean make-up air should be introduced in sufficient volume to maintain correct operation of the local exhaust system.
- For maintenance and decontamination activities, authorized employees entering the area should be provided with and required to wear clean, impervious garments, including gloves, boots and continuous-air supplied hood. Prior to removing protective garments the employee should undergo decontamination and be required to shower upon removal of the garments and hood.
- Except for outdoor systems, regulated areas should be maintained under negative pressure (with respect to non-regulated areas).
- Local exhaust ventilation requires make-up air be supplied in equal volumes to replaced air.
- Laboratory hoods must be designed and maintained so as to draw air inward at an average linear face velocity of 150 feet/ min. with a minimum of 125 feet/ min. Design and construction of the fume hood requires that insertion of any portion of the employees body, other than hands and arms, be disallowed.

Section 9 - PHYSICAL AND CHEMICAL PROPERTIES

PHYSICAL PROPERTIES

Solid.
Does not mix with water.

State	Divided solid	Molecular Weight	615.34
Melting Range (°F)	>572	Viscosity	Not Applicable
Boiling Range (°F)	Not available	Solubility in water (g/L)	Partly miscible
Flash Point (°F)	Not available	pH (1% solution)	Not applicable
Decomposition Temp (°F)	Not available.	pH (as supplied)	Not applicable
Autoignition Temp (°F)	Not available	Vapour Pressure (mmHG)	Negligible
Upper Explosive Limit (%)	Not available.	Specific Gravity (water=1)	Not available
Lower Explosive Limit (%)	Not available	Relative Vapor Density (air=1)	>1
Volatile Component (%vol)	Negligible	Evaporation Rate	Not applicable

APPEARANCE

Dark-maroon powder; does not mix well with water.

Section 10 - CHEMICAL STABILITY

CONDITIONS CONTRIBUTING TO INSTABILITY

■

- Presence of incompatible materials.
- Product is considered stable.
- Hazardous polymerization will not occur.

STORAGE INCOMPATIBILITY

■

- Toxic gases are formed by mixing azo and azido compounds with acids, aldehydes, amides, carbamates, cyanides, inorganic fluorides, halogenated organics, isocyanates, ketones, metals, nitrides, peroxides, phenols, epoxides, acyl halides, and strong oxidizing or reducing agents.
- Flammable gases are formed by mixing azo and azido compounds with alkali metals.
- Explosive combination can occur with strong oxidizing agents, metal salts, peroxides, and sulfides.

Avoid reaction with oxidizing agents.

For incompatible materials - refer to Section 7 - Handling and Storage.

Section 11 - TOXICOLOGICAL INFORMATION

C.I. Reactive Red 2

TOXICITY AND IRRITATION

■ unless otherwise specified data extracted from RTECS - Register of Toxic Effects of Chemical Substances.

TOXICITY	IRRITATION
Oral (rat) LD50: 7460 mg/kg	Nil Reported
Intraperitoneal (rat) LD50: 100 mg/kg	
Oral (mouse) LD50: 2100 mg/kg	
Oral (g.pig) LD50: 2100 mg/kg	

■ Contact allergies quickly manifest themselves as contact eczema, more rarely as urticaria or Quincke's edema. The pathogenesis of contact eczema involves a

cell-mediated (T lymphocytes) immune reaction of the delayed type. Other allergic skin reactions, e.g. contact urticaria, involve antibody-mediated immune reactions. The significance of the contact allergen is not simply determined by its sensitization potential: the distribution of the substance and the opportunities for contact with it are equally important. A weakly sensitizing substance which is widely distributed can be a more important allergen than one with stronger sensitizing potential with which few individuals come into contact. From a clinical point of view, substances are noteworthy if they produce an allergic test reaction in more than 1% of the persons tested.
Allergic reactions involving the respiratory tract are usually due to interactions between IgE antibodies and allergens and occur rapidly. Allergic potential of the allergen and period of exposure often determine the severity of symptoms. Some people may be genetically more prone than others, and exposure to other irritants may aggravate symptoms. Allergy causing activity is due to interactions with proteins.
Attention should be paid to atopic diathesis, characterized by increased susceptibility to nasal inflammation, asthma and eczema.
Exogenous allergic alveolitis is induced essentially by allergen specific immune-complexes of the IgG type; cell-mediated reactions (T lymphocytes) may be involved. Such allergy is of the delayed type with onset up to four hours following exposure.
The material may produce moderate eye irritation leading to inflammation. Repeated or prolonged exposure to irritants may produce conjunctivitis.

- NOTE: Detailed analysis of the molecular structure, by various Authorities/ Agencies and in other cases by Chemwatch, indicates that the azo colourant can split off carcinogenic arylamines.

The azo linkage is considered the most labile portion of an azo dye. The linkage easily undergoes enzymatic breakdown, but thermal or photochemical breakdown may also take place. The breakdown results in cleavage of the molecule and in release of the component amines. Water solubility determines the ultimate degradation pathways of the dyes. For example the azo linkage of many azo pigments is, due to very low solubility in water, not available for intracellular enzymatic breakdown but may be susceptible to endogenous micro-organisms found in the bladder or in the gut.
After cleavage of the azo linkage by bacteria, the component aromatic amines are absorbed in the intestine and excreted in the urine. Twenty-two of the component amines are recognised as potential human carcinogens, and/or several of them have shown carcinogenic potential on experimental animals. Sulfonation of the dye reduces the toxicity by enhancement of the excretion.
The component amines which may be released from azo dyes are mostly aromatic amines (compounds where an amine group or amine-generating group(s) are connected to an aryl moiety). In general, aromatic amines known as carcinogenic may be grouped into five groups

- Anilines, e.g. o-toluidine.
- Extended anilines, e.g. benzidine.
- Fused ring amines, e.g. 2-naphthylamine.
- Aminoazo and other azo compounds, e.g. 4-(phenylazo)aniline.
- Heterocyclic amines.

The aromatic amines containing moieties of anilines, extended anilines and fused ring amines are components of the majority of the industrially important azo dyes.
Reductive fission of the azo group, either by intestinal bacteria or by azo reductases of the liver and extra-hepatic tissues can cause benzidine-based aromatic amines to be released. Such breakdown products have been detected in animal experiments as well as in man (urine). Mutagenicity, which has been observed with numerous azo colourants in in vitro test systems, and the carcinogenicity in animal experiments are attributed to the release of amines and their subsequent metabolic activation. There are now epidemiological indications that occupational exposure to benzidene-based azo colourants can increase the incidence of bladder carcinoma.
The acute toxicity of azo dyes is low.. However, potential health effects are recognised.
Despite a very broad field of application and exposure, sensitising properties of azo dyes have been identified in relatively few reports. Red azoic dyes have been linked to allergic contact dermatitis in heavily exposed workers. Furthermore, textiles coloured with disperse azo dyes have caused allergic dermatitis in a few cases.

Section 12 - ECOLOGICAL INFORMATION

Refer to data for ingredients, which follows:
C.I. REACTIVE RED 2:
■ For reactive dyes:
Environmental fate:
Reactive dyes are anionic and are hydrolysed rapidly in aqueous solution. Reactive dyes bind, covalently, to textiles. The fixation competes with the reaction of the leaving group of the reactive dye with water (hydrolysis). Therefore the non-fixed dye in a dye bath is the hydrolysed derivative, which no longer exhibits the characteristics of the reactive substance. One of the characteristics of these reactive dyes, with a few exceptions, is that the aromatic moieties carry sulfonic groups. Chemical or enzymatic reduction leads to the formation of amino sulfonic acids .
Fibre reactive dyes are designed to have a degree of photostability and therefore their photodegradation behaviour has not been widely investigated. Little is known of their stability to daylight over prolonged periods of irradiation in dilute aqueous solutions and in the presence of humic substances.
For the reactive dyes the abiotic half-life due to hydrolysis is approximately 2 days
Ecotoxicity:
Reactive dyes generally have very high effect concentration levels (>100 mg/l) and are not considered to be toxic to aquatic organisms.
■ Anionic (acid) dyes exhibit a range of aquatic toxicities.
Analysis of over 200 acid dyes have indicated that some monoacid and diacid dyes can show moderate to high toxicity (i.e acute vales <100 mg/l and <1 mg/l) to fish and aquatic organisms. Dyes with three or more acid groups show low toxicity (i.e acute values >100 mg/l) towards fish and invertebrates. Some chelated dyes, i.e.., Al, Co, Cr, Fe, have shown moderate toxicity towards fish and daphnids ad the toxicity has not been explained by the residual free (unchelated) metal ion in the dye product. All acid dyes show moderate toxicity towards green algae; these effects seem to be indirect and may result from shading Virtually all dyes from all chemically distinct groups are prone to fungal oxidation but there are large differences between fungal species with respect to their catalysing power and dye selectivity. A clear relationship between dye structure and fungal dye biodegradability has not been established. Fungal degradation of aromatic structures is a secondary metabolic event that starts when nutrients (C, N and S) become limiting. Therefore, while the enzymes are optimally expressed under starving conditions, supplementation of energy substrates and nutrients are necessary for propagation of the cultures.
Many dyes are visible in water at concentrations as low as 1 mg/l Textile-processing waste waters, typically with a dye content in the range 10- 200 mg /l are therefore usually highly coloured and discharge in open waters presents an aesthetic problem. As dyes are designed to be chemically and photolytically stable, they are highly persistent in natural environments. It is thus unlikely that they, in general, will give positive results in short-term tests for aerobic biodegradability. The release of dyes may therefore present an ecotoxic hazard and introduces the potential danger of bioaccumulation that may eventually affect man by transport through the food chain.

Hazard Alert Code Key:	EXTREME	HIGH	MODERATE	LOW

■ Biodegradation of azo dyes can occur in both aerobic and anaerobic environments. In both cases, the initial step in the biodegradation is the reductive cleavage of the azo-bond. Under aerobic conditions the initial step of cleavage of the azo-bond is typically followed by hydroxylation and ring opening of the aromatic intermediates.
The electron-withdrawal character of azo-groups generates electron deficiency and thus makes the compounds less susceptible to oxidative catabolism. As a consequence, many of these chemicals tend to persist under aerobic environmental conditions. Aerobic degradation of azo dyes is not expected as oxygen is often an inhibitor of azo reduction. Biodegradation of these dyes by aerobic sludge is reported to be insignificant as greater than 50% of the dye remains unchanged or is only slightly modified.
Reduction of azo dyes occurs primarily under anaerobic conditions through cleavage of the azo linkage. While azo dyes are generally stable under aerobic conditions, they are susceptible to reductive degradation under the anaerobic conditions characteristic of sediment. A possible pathway of azo dye degradation is azo-reductase under anaerobic conditions followed by mineralisation under aerobic conditions, with the resultant end products being NH3, CO2 and H2O.
The great majority of azo dyes are water soluble and they colour different substrates by becoming physically attached. The attachment may be due to adsorption, absorption or mechanical adherence. Most of the commercial available azo dyes are in fact formulations of several components in order to improve the technical properties of the dyeing process.
The content of a specific dye lies in the range of 10 to 98%.
Soluble azo dyes, which are likely to remain in solution and therefore are unlikely to adsorb to sediment or sludge, the above anaerobic pathway is unlikely to occur.
An important natural abiotic degradation mechanism is photolysis and hydrolysis as a function of pH in the range of pH 4-9 . The evidence of the role of hydrolysis in degradation of azo dyes is not conclusive. Even though the dyes have absorption maxima in the range of visible and UV-light, photo-reduction does not play a dominant role in the environmental fate of dyes, although its contribution to the total mineralisation of widely dispersed trace amounts may be underestimated. Furthermore, hydrolysis seems not to be an important degradation pathway either, except for reactive dyes, which are hydrolysed rapidly in aqueous solution. For the metabolites, photolysis may be of some importance, whereas hydrolysis does not seem to be an important degradation route.
If the dye is not broken during rigors of biological waste treatment, it is unlikely to degrade rapidly in the less severe conditions of the environment. The reductive cleavage of the azo-bond is the major degradation pathway for azo dyes. Photo-reduction of azo dyes to hydrazines and amines is possible, but it is likely to be very slow, except in oxygen-poor water. The stability of the dyes to visible and UV-light is very high, and therefore only slow degradation has been shown. The photo-stability of azo dyestuffs is high in pure water but in the presence of natural humic materials, the photo decomposition is strongly accelerated, probably through oxidation by single oxygen or oxy-radicals
Although azo dyes are generally not readily or inherently biodegradable, bioaccumulation or adsorption to sediment is not expected due to their, generally, low partition coefficient
Certain of the Acid and Basic azo dyes are acutely toxic to aquatic organisms (fish, crustaceans, algae and bacteria); this is also true of some Direct dyes. Reactive dyes generally have very high effect concentration levels (>100 mg/l) and are not considered to be toxic to aquatic organisms. The non-ionic (Disperse and Solvent) dyes are toxic or potentially toxic. Solvent dyes may even be acutely toxic to aquatic organisms. The Mordant dyes (nonionics) generally do not exhibit any toxicity at levels below 100 mg/l.
■ DO NOT discharge into sewer or waterways.

Section 13 - DISPOSAL CONSIDERATIONS

Disposal Instructions

All waste must be handled in accordance with local, state and federal regulations.
¦ Puncture containers to prevent re-use and bury at an authorized landfill.
Legislation addressing waste disposal requirements may differ by country, state and/ or territory. Each user must refer to laws operating in their area. In some areas, certain wastes must be tracked.
A Hierarchy of Controls seems to be common - the user should investigate:

- Reduction
- Reuse
- Recycling
- Disposal (if all else fails)

This material may be recycled if unused, or if it has not been contaminated so as to make it unsuitable for its intended use. Shelf life considerations should also be applied in making decisions of this type. Note that properties of a material may change in use, and recycling or reuse may not always be appropriate.
DO NOT allow wash water from cleaning equipment to enter drains. Collect all wash water for treatment before disposal.

- Recycle wherever possible.
- Consult manufacturer for recycling options or consult Waste Management Authority for disposal if no suitable treatment or disposal facility can be identified.
- Dispose of by: Burial in a licensed land-fill or Incineration in a licensed apparatus (after admixture with suitable combustible material)
- Decontaminate empty containers. Observe all label safeguards until containers are cleaned and destroyed.

Section 14 - TRANSPORTATION INFORMATION

NOT REGULATED FOR TRANSPORT OF DANGEROUS GOODS: DOT, IATA, IMDG

Section 15 - REGULATORY INFORMATION

C.I. Reactive Red 2 (CAS: 17804-49-8,12226-03-8,104982-30-1,11100-36-0,12627-09-7,139074-70-7,39361-94-9,56646-11-8,58517-07-0,74565-18-7,80147-49-5,95328-60-2) is found on the following regulatory lists;
"Canada Domestic Substances List (DSL)","US Toxic Substances Control Act (TSCA) - Inventory"

Section 16 - OTHER INFORMATION

Ingredients with multiple CAS Nos

Reactive red 2

sc-215800

Material Safety Data Sheet

Hazard Alert Code Key:	EXTREME	HIGH	MODERATE	LOW

Ingredient Name	CAS
C.I. Reactive Red 2	17804-49-8, 12226-03-8, 104982-30-1, 11100-36-0, 12627-09-7, 139074-70-7, 39361-94-9, 56646-11-8, 58517-07-0, 74565-18-7, 80147-49-5, 95328-60-2

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■ Classification of the mixture and its individual components has drawn on official and authoritative sources as well as independent review by the Chemwatch Classification committee using available literature references.
A list of reference resources used to assist the committee may be found at:
www.chemwatch.net/references.

■ The (M)SDS is a Hazard Communication tool and should be used to assist in the Risk Assessment. Many factors determine whether the reported Hazards are Risks in the workplace or other settings. Risks may be determined by reference to Exposures Scenarios. Scale of use, frequency of use and current or available engineering controls must be considered.

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