



SASOL

# Product Stewardship Summary

Cresols

**Introduction:**

Cresols are naturally-occurring compounds which are found in a wide variety of ordinary materials. Small amounts are present in various foods, flower extracts, essential oils, wine, tea, and roasted coffee. They are present in wood and tobacco smoke. They are also produced in low concentrations as metabolites by living organisms including humans.

Identified and first synthesized in the late 1800's, cresols have long been important chemical building blocks. Commercial sourcing of cresols began with coal tar distillation and, later, extraction from petroleum refinery caustics. Today, Sasol cresols are primarily extracted and purified from coal gasification process streams. They are also made synthetically from toluene and cumene.

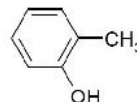
Sasol cresols are used predominantly by other chemical manufacturers and industrial users. They may be used as individual pure isomers, as mixed cresols, or as part of more complex mixtures of related compounds, known together as cresylic acids. Cresols are highly versatile compounds and are key raw materials in many different manufacturing processes due to their unique reactivity and solvency properties. Although cresols are hazardous materials, they are safely used in processes and products that benefit consumers. Cresols are often consumed entirely during use or reacted to become nonhazardous substances. The typical American uses countless products which involve cresols somewhere in their manufacture.



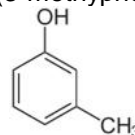
**Chemical Identity:**

Cresols refer to any of the three isomers of methylphenol ( $\text{CH}_3\text{C}_6\text{H}_4\text{OH}$ ) or to combinations thereof. They may also be known as hydroxytoluene. The individual isomers are:

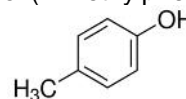
- ortho-cresol (2-methylphenol, CAS # 95-48-7)



- meta-cresol (3-methylphenol, CAS # 108-39-4)



- para-cresol (4-methylphenol, CAS # 106-44-5).



**Uses:**

Common uses for cresols are:

- Manufacture of resins and plastics for computer chips, circuit boards, can coatings, and construction materials.
- Manufacture of herbicides to control weeds in agricultural crops.
- Production of antioxidants to protect plastics and rubber from weathering and oils and foods from spoiling.
- Production of sunscreen ingredients intermediates for Vitamin E, and other pharmaceuticals and fragrances.
- Manufacture of flame retardant phosphate esters used as additives in plastics and lubricants.
- Catalysts for materials used in nylon production for carpeting.
- Reactive solvent in applying insulation to magnet wire for transformers and electrical motors found in cars, home appliances, and power tools.
- Production of fuel additives.
- Blending with other phenolic compounds for solvents, mining and oilfield chemicals, and disinfectants.
- Solvent for reactor cleaning in the pharmaceutical industry.
- Intermediate in service life articles with low release (plastic articles, electrical batteries and accumulators).



**Description and Properties:**

Cresols may be liquids or solid crystalline materials, depending on the isomer composition and the

temperature. They range from colorless to yellow, amber, red or brown. Cresols are weak organic acids which are partly miscible in water. They have a low vapor pressure but exhibit an antiseptic odor which is noticeable at concentrations below regulatory exposure limits. Cresols are not flammable but will burn shortly on approach of an ignition source. They are stable under recommended storage conditions.

**Health Information:**

The primary dangers posed in handling cresols are those resulting from physical exposure. Cresols are highly corrosive and contact with exposed skin or mucous membranes causes severe burns. Cresols also exhibit anesthetic properties. Therefore, victims may misjudge the extent of their exposure when the initial burning sensation subsides. This can result in prolonged contact, causing toxic effects in addition to the corrosive damage.

Cresols are readily absorbed through the skin and mucous membranes in liquid or vapor form and act as systemic toxins. Relatively small areas of exposure (e.g. an arm or a hand) can allow sufficient absorption to cause severe poisoning. Progressive symptoms of such poisoning include headache, dizziness, ringing in the ears, nausea, vomiting, muscular twitching, mental confusion, loss of consciousness and possible death from lethal paralysis of the central nervous system. Chronic exposure can lead to loss of appetite, vomiting, nervous disorders, headaches, dizziness, fainting and dermatitis. Cresols are not listed as mutagens or carcinogens. There is low concern for reproductive or developmental toxic effects.

**Health Effects Summary:**

Effect Assessment	Result
Acute Toxicity	Toxic if swallowed. Toxic in contact with skin, The data on acute inhalation toxicity is very limited and does not allow final conclusion.
Irritation / corrosion	Corrosive. Causes severe skin burns and eye damage. Known to be a respiratory irritant.

**Health Effects Summary (continued):**

Effect Assessment	Result
Sensitization	Not considered to be sensitizing.
Toxicity after repeated exposure	Based on available data no classification is required. The most prominent effect is the induction of corrosion after repeated exposure.
Genotoxicity / mutagenicity	Based on available data no classification is required. The majority of the in vitro and in vivo studies showed no mutagenic effects.
Carcinogenicity	Not considered as carcinogenic.
Toxicity for reproduction	Available data do not indicate reproductive toxicity potential.



**Exposure Potential:**

Because they are toxic and corrosive, cresols are regulated as hazardous materials. They are used primarily by other chemical manufacturers; therefore chemical and transportation workers have the highest risk of exposure. Sasol does not sell cresols for direct consumer use. However, downstream products containing cresols which consumers may encounter include carburetor cleaners, degreasers, paint strippers and disinfectants. Consumers should always consult product labels for hazard and safe handling information.

**Environmental Information:**

Cresols are toxic to fish and aquatic invertebrates and care must be taken to prevent them from entering surface or ground waters. Cresols tend to sink in fresh water but will float in concentrated brine. They are biodegradable in aerobic conditions. Soil or other materials contaminated with cresols may become hazardous and must be disposed of by trained personnel according to regulations. In case of fire, cresol vapors may form and be carried with smoke downwind, creating the possibility of exposure. Cresols have a low potential for bioaccumulation.

**Risk Management:**

Cresols can be stored, transferred, processed and disposed of safely when proper procedures and safeguards are employed in industrial use. Cresol production is carried out in equipment designed to prevent exposure to workers and release to the environment. Tanks, piping, pumps, and other processing equipment are specified for handling of cresols. Secondary containment around storage tanks, process air combustion, scrubbers and other means are used to further protect from release to the environment. Access to the production facility is restricted to employees, and approved contractors and visitors.

**Environmental Effects Summary:**

Effect Assessment	Result
Aquatic Toxicity	Acutely toxic to aquatic life. Harmful to aquatic life with long lasting effects.

**Environmental Fate Summary:**

Fate and Behavior	Result
Biodegradation	Readily biodegradable.
Bioaccumulation potential	Low potential for bioaccumulation.
Mobility	Not expected to adsorb on soil. The product evaporates slowly.

Personal protective equipment such as chemical resistant suits, gloves and boots, goggles or face shields must be worn when handling or transferring cresols as dictated by the extent of potential exposure. Steel drums, tank trucks, railcars and other transport vessels are inspected prior to and after loading to ensure that no product is released. Carriers are approved and their performance

reviewed. Sasol utilizes Chemtrec® and the National Chemical Emergency Centre (NCEC) as 24 hour contact numbers to provide emergency response information to transportation workers and first responders in the case of an accident en route.



Safety Data Sheets (SDS) for each product and practical safe handling information are provided to our customers and carriers so that they are able to use and transport our products safely. These documents include chemical and physical properties, recommended storage conditions and personal protective equipment, firefighting and first aid information, accidental release measures, exposure guidelines and other regulatory information. Please refer to these documents for additional details.



### Regulatory Information:

Cresols are classified as hazardous for workers and in transportation. They are regulated under a variety of local, state, federal and international laws requiring exposure and environmental controls, as well as various means of hazard communication such as labeling and SDS. Cresols have been registered under REACH (CE) 1907/2006.

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### Classification and labelling

Under GHS, substances are classified according to their physical, health, and environmental hazards. The hazards are communicated via specific labels and the SDS. GHS attempts to standardize hazard communication so that the intended audience (workers, consumers, transport workers, and emergency responders) can better understand the hazards of the chemicals in use. The following classification and labelling information is based on the US Occupational Safety and Health Administration (OSHA) Hazard Communication Standard. Other regional classification and labelling information, such as substances registered for REACH in the European Union (EU), may differ from the US classification and labelling information.

### Classification

- Flammable liquids Category 4
- Acute oral toxicity Category 3
- Acute dermal toxicity Category 3
- Skin corrosion/irritation Category 1B
- Serious eye damage/irritation Category 1
- Acute aquatic toxicity Category 2
- Chronic aquatic toxicity Category 3

### Labelling

Signal word: Danger

### Hazard pictograms:



### Hazard statements:

- H227: Combustible Liquid
- H301: Toxic if swallowed
- H311: Toxic in contact with skin.
- H314: Causes severe skin burns and eye damage.
- H401: Toxic to aquatic life
- H412: Harmful to aquatic life with long lasting effects.

Precautionary statements:

P301 + P310 - IF SWALLOWED: Immediately call a POISON CENTER or doctor/ physician

P301 + P330 + P331 - IF SWALLOWED: rinse mouth. Do NOT induce vomiting

P260 - Do not breathe dust / fume / gas / mist / vapors/spray

P304 + P340 - IF INHALED: Remove to fresh air and keep at rest in a position comfortable for breathing

P280 - Wear protective gloves/ protective clothing/ eye protection/ face protection

P303 + P361 + P353 - IF ON SKIN (or hair): Remove/ Take off immediately all contaminated clothing. Rinse skin with water/ shower

P305 + P351 + P338 - IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing

P310 - Immediately call a POISON CENTER or doctor/ physician

P403 + P235 - Store in a well-ventilated place. Keep cool

P210 - Keep away from heat/sparks/open flames/hot surfaces. - No smoking

P370 + P378 - In case of fire: Use dry sand, dry chemical or alcohol-resistant foam for extinction

P273 - Avoid release to the environment.

**Product Stewardship:**

Sasol is firmly committed to the safe manufacture, handling and distribution of our products. We incorporate product stewardship and safety into our operating and business decisions. We actively communicate our product stewardship expectations to new and existing customers and distributors. Our procedures require evaluation of potential customers with regard to the suitability of the proposed use and the safe handling systems in place prior to establishing a supply relationship. We conduct audits of customers, warehouses, and carriers as appropriate. We perform an annual product risk review, including all customers and

shipping locations, to identify actions we can take to further minimize risk with regard to distribution and use of cresols. Progress is tracked in implementing the identified actions. Results of this review are communicated throughout the organization so that employees are aware of the specific ways in which we meet our commitment to product stewardship and how they can support the effort.

We provide SDS and safe handling information to customers. We welcome questions and open communication with customers regarding practical handling and safety practices for our products. Our SHES (safety, health, environmental & security), operations, maintenance and technical service personnel are ready resources for customers and others involved in using or transporting our products.

**Conclusion:**

Cresols are an important chemical feedstock for products that consumers use every day at home, in travel, and in the workplace. They have a long history of helping make our lives more comfortable, safe, productive and healthy. Although cresols themselves are hazardous materials, they are regulated for public safety and measures are in place for their safe manufacture, storage, distribution and use.

**For Further Information:**

E-mail address	<a href="mailto:usasales@sasol.com">usasales@sasol.com</a>
ICCA portal	<a href="http://www.icca-chem.org/en/Home/Global-Product-Strategy/">http://www.icca-chem.org/en/Home/Global-Product-Strategy/</a>

**Glossary:**

Acute toxicity	Harmful effect resulting from a single or short term exposure to a substance.
Biodegradation	Decomposition or breakdown of a substance under natural conditions (action of microorganisms, etc.).

Bioaccumulation	Progressive accumulation in living organisms of a chemical substance present in the environment.
Carcinogenicity	Substance effects causing cancer.
Chronic toxicity	Harmful effect after repeated exposures or long term exposure to a substance.
Clastogenicity	Substance effect that causes breaks in chromosomes.
Embryotoxicity	Harmful effect on fetal health.
Flash point	The lowest temperature at which vapor of the substance may form an ignitable mixture with air.
Genotoxicity	Substance effect that causes damage to genes, including mutagenicity/clastogenicity.
GHS	Global Harmonized System on Classification and Labelling of chemicals.
Hazard	Inherent substance property bearing a threat to health or environment.
Mutagenicity	Substance effect that cause mutation on genes.
Persistence	Refers to the length of time a compound stays in the environment, once introduced.
REACH	REACH stands for Registration, Evaluation, Authorisation and Restriction of Chemicals. REACH is a regulation of the European Union, adopted to improve the protection of human health and the environment from the risks that can be posed by chemicals, while enhancing the competitiveness of the EU chemicals industry.
Reprotoxicity	Including teratogenicity, embryotoxicity and harmful effects on fertility.
Sensitizing	Allergenic.
Sediment	Topsoil, sand and minerals washed from land into water forming in the end a layer at the bottom of rivers and sea.

Teratogenic	Substance effect on fetal morphology.
Vapor pressure	A measure of a substance's property to evaporate.
Volatile	Any substance that evaporates readily.

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**References:**

Ullmann's Encyclopedia of Industrial Chemistry, Release 2003, 6<sup>th</sup> edition

Safe Handling of Cresols, Xylenols & Cresylic Acids, 2015

ASTM Method D 3852-99 – Standard Practice for Sampling and Handling Phenol, Cresols and Cresylic Acid

Product Safety Data Sheet

**Disclaimer:**

*This product stewardship summary is intended to give general information about the chemical or categories of chemicals addressed. It is not intended to provide an in-depth discussion of health and safety information. Additional information is available through the chemical's applicable Safety Data Sheet which should be consulted before use of the chemical. The product stewardship summary does not supplant or replace required regulatory and/or legal communication documents.*

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