



SASOL

Product Stewardship Summary

Cresylic Acids

Introduction:

Cresylic acid is a generic term referring to combinations of both cresols and xylenols along with phenol or various other alkylphenols (ethylphenols, propylphenols, etc.). Phenolic compounds in this family are found in a wide variety of ordinary materials. Small amounts are present in various foods, flower extracts, essential oils, wine, tea, roasted coffee, wood and tobacco smoke. They are also produced in low concentrations as metabolites by living organisms including humans.

Cresylic acids have long been important chemical building blocks. Commercial sourcing of cresylic acid began with coal tar distillation and, later, extraction from petroleum refinery caustics. Today, Sasol cresylic acids are primarily extracted and purified from coal gasification process streams.

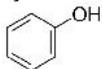


Sasol cresylic acids are used predominantly by other chemical manufacturers and industrial users. They are key raw materials in a variety of manufacturing processes due to their unique reactivity and solvency properties. Although cresylic acids are hazardous materials, they are safely used in processes and products that benefit consumers. It is often the case that cresylic acid is consumed entirely during use or reacted to become nonhazardous substances. The typical American uses countless products which involve cresylic acid somewhere in their manufacture.

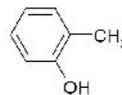
Chemical Identity:

Cresylic acids are commonly mixtures of methylphenol [$\text{CH}_3\text{C}_6\text{H}_4\text{OH}$], dimethylphenol [$(\text{CH}_3)_2\text{C}_6\text{H}_3\text{OH}$], ethylphenol [$\text{C}_2\text{H}_5\text{C}_6\text{H}_4\text{OH}$], and may include phenol. The CAS # for cresylic acid is 1319-77-3. Primary individual isomers are:

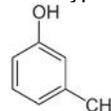
- phenol (hydroxybenzene, CAS # 108-95-2)



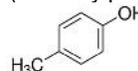
- ortho-cresol (2-methylphenol, CAS # 95-48-7)



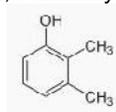
- meta-cresol (3-methylphenol, CAS # 108-39-4)



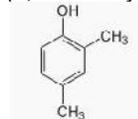
- para-cresol (4-methylphenol, CAS # 106-44-5)



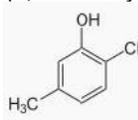
- 2,3-xylene (2,3-dimethylphenol, CAS # 526-75-0)



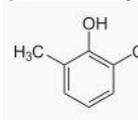
- 2,4-xylene (2,4-dimethylphenol, CAS # 105-67-9)



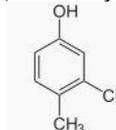
- 2,5-xylene (2,5-dimethylphenol, CAS # 95-87-4)



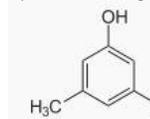
- 2,6-xylene (2,6-dimethylphenol, CAS # 576-26-1)



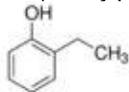
- 3,4-xylene (3,4-dimethylphenol, CAS # 95-65-8)



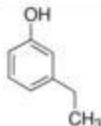
- 3,5-xylene (3,5-dimethylphenol, CAS # 108-68-9)



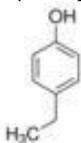
- ortho-ethylphenol (2-ethylphenol, CAS # 90-00-6)



- meta-ethylphenol (3-ethylphenol, CAS # 620-17-7)



- para-ethylphenol (4-ethylphenol, CAS # 123-07-9)



Sasol sells a variety of products known as cresylic acid which are designated by different product codes to distinguish their composition and specifications.

Uses:

Common uses for cresylic acids are:

- Manufacture of resins and plastics for circuit boards, can coatings, laminates and construction materials.
- Reactive solvent in applying insulation to magnet wire for transformers and electrical motors of all sizes found in cars, home appliances, and power tools.
- Solvents, mining and oilfield chemicals, and disinfectants.



Description and Properties:

Cresylic acids are typically liquids, although they may crystallize, depending on isomer composition and the temperature. They range from colorless to yellow, amber, red or brown.

Cresylic acids 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. Cresylic acids are not flammable but will burn. They are stable under recommended storage conditions.



Health Information:

The primary dangers posed in handling cresylic acids are those resulting from physical exposure. Cresylic acids are corrosive and contact with exposed skin or mucous membranes causes severe burns. Cresylic acids 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.

Cresylic acids 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. Cresylic acids containing xylenol isomers may exhibit a skin sensitizing potential. Chronic exposure can lead to loss of appetite, vomiting, nervous disorders, headaches, dizziness, fainting and dermatitis. Cresylic acids are not listed as carcinogens but cresylic acids containing phenol are suspected of causing genetic damage.

Health Effects Summary:

| Effect Assessment | Result |
|----------------------------------|---|
| Acute Toxicity | Toxic if swallowed. Toxic in contact with skin. Toxic if inhaled. |
| Irritation / corrosion | Corrosive: Causes severe skin burns and eye damage. |
| Sensitization | May cause an allergic skin reaction. |
| Toxicity after repeated exposure | May cause damage to kidney, liver, skin, nervous system through prolonged or repeated exposure. |
| Genotoxicity / mutagenicity | Suspected of causing genetic defects. |
| Carcinogenicity | Available data indicated that classification is not warranted. |
| Toxicity for reproduction | Available data do not indicate reproductive toxicity potential. |

Environmental Information:

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

Environmental Effects Summary:

| Effect Assessment | Result |
|-------------------|--|
| Aquatic Toxicity | Toxic to aquatic life with long lasting effects. |

Environmental Fate Summary:

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



Exposure Potential:

Because they are toxic and corrosive, cresylic acids 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 cresylic acids for direct consumer use. However, downstream products containing them which consumers may encounter include carburetor cleaners, de-greasers, paint strippers and disinfectants. Consumers should always consult product labels for hazard and safe handling information.

Risk Management:

Cresylic acids can be stored, transferred, processed and disposed of safely when proper procedures and safeguards are employed in industrial use. Cresylic acid 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 cresylic acids. 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. Personal protective equipment such as chemical resistant suits, gloves and boots, goggles or face shields must be worn when handling or transferring cresylic acids 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.



Sasol provides safety data sheets (SDS) for each product and practical safe handling information to our customers and carriers so that they are able to use and transport our products safely. These documents include hazard information, 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:

Cresylic acids are classified as hazardous for workers and transport. 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 safety data sheets.

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

- Combustible liquids Category 4
- Acute oral toxicity Category 3
- Acute dermal toxicity Category 3
- Acute inhalation toxicity Category 3
- Skin corrosion/irritation Category 1B
- Serious eye damage Category 1
- Skin sensitization Category 1
- Germ cell mutagenicity Category 2
- Specific target organ systemic toxicity (repeated exposure) Category 2
- Acute aquatic toxicity Category 2
- Chronic aquatic toxicity Category 2

Labelling

Signal word: Danger

Hazard pictograms:



Hazard statements:

- H227: Combustible Liquid
- H301: Toxic if swallowed.
- H311: Toxic in contact with skin.
- H331: Toxic if inhaled.
- H314: Causes severe skin burns and eye damage.
- H317: May cause an allergic skin reaction.
- H341: Suspected of causing genetic defects.
- H373: May cause damage to organs through prolonged or repeated exposure.
- H411: Toxic 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 + P233 - Store in a well-ventilated place. Keep container tightly closed
- 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 committed to the safe manufacture, handling and distribution of our products. We incorporate product stewardship 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

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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 cresylic acids. 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 safety & health, operations, maintenance and technical service personnel are ready resources for customers and others involved in using or transporting our products.

Conclusion:

Cresylic acids 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 cresylic acids 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 | usasales@sasol.com |
| ICCA portal for additional information | http://www.icca-chem.org/en/Home/Global-Product-Strategy/ |

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 and 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. |

Date of Issue:

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Revision: 3

References:

Ullmann's Encyclopedia of Industrial Chemistry, Release 2003, 6th 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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