

SAFETY DATA SHEET

1. SUBSTANCE AND SOURCE IDENTIFICATION

Product Identifier

SRM Number: 2779
SRM Name: Gulf of Mexico Crude Oil
Other Means of Identification: Not applicable.

Recommended Use of This Material and Restrictions of Use

This Standard Reference Material (SRM) is intended for use in evaluating analytical methods for the determination of selected polycyclic aromatic hydrocarbons (PAHs), hopanes, and steranes in a crude oil matrix. All of the constituents for which certified, reference, and information values are provided in the Certificate of Analysis are naturally present in the oil. A unit of SRM 2779 consists of five ampoules each containing 1.2 mL of crude oil.

Company Information

National Institute of Standards and Technology
 Standard Reference Materials Program
 100 Bureau Drive, Stop 2300
 Gaithersburg, Maryland 20899-2300

Telephone: 301-975-2200
 E-mail: SRMMSDS@nist.gov
 Website: <https://www.nist.gov/srm>

Emergency Telephone ChemTrec:
 1-800-424-9300 (North America)
 +1-703-527-3887 (International)

2. HAZARDS IDENTIFICATION

Classification

Physical Hazard:	Flammable Liquid	Category 2
Health Hazard:	Skin Irritation	Category 2
	Eye Irritation	Category 2B
	Germ Cell Mutagenicity	Category 1B
	Carcinogenicity	Category 1B
	Reproductive Toxicity	Category 2
	STOT, Single Exposure	Category 3
	STOT, Repeated Exposure	Category 1
	Aspiration Hazard	Category 1

Label Elements
Symbol

Signal Word

Danger

Hazard Statement(s)

H225	Highly flammable liquid and vapor.
H304	May be fatal if swallowed and enters airways.
H315+H320	Causes skin and eye irritation.
H340	May cause genetic effects.
H350	May cause cancer.
H361	Suspected of damaging fertility or the unborn child.
H336	May cause drowsiness or dizziness.
H373	May cause damage to organs (liver, kidneys, and nervous system) through prolonged or repeated exposure.

Precautionary Statement(s)

P201	Obtain special instructions before use.
P202	Do not handle until all safety precautions have been read and understood.
P210	Keep away from heat, sparks, open flames, hot surfaces. — No smoking.
P241	Use explosion-proof electrical, ventilating, and lighting equipment.
P242	Use only non-sparking tools.
P243	Take precautionary measures against static discharge.
P260	Do not breathe fumes, mist, vapors, or spray.
P264	Wash hands thoroughly after handling.
P270	Do not eat, drink, or smoke when using this product.
P271	Use only outdoors or in a well-ventilated area.
P280	Wear protective gloves, eye protection, and protective clothing.
P301+P310+P331	If swallowed: Immediately call a doctor. Do NOT induce vomiting.
P302+P361+P352	If on skin (or hair): Take off immediately all contaminated clothing. Rinse skin with water.
P304+P340	If inhaled: Remove person to fresh air and keep comfortable for breathing.
P305+P351+P338	If in eyes: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.
P308+P313	If exposed or concerned: Get medical attention.
P332+P337+P313	If skin or eye irritation occurs: Get medical attention.
P362+P364	Take off contaminated clothing and wash it before reuse.
P403+P235+P233	Store in a well-ventilated place. Keep cool. Keep container tightly closed.
P405	Store locked up.
P501	Dispose of contents and container according to local regulations.

Hazards Not Otherwise Classified: None.

Ingredients(s) with Unknown Acute Toxicity: None.

3. COMPOSITION AND INFORMATION ON HAZARDOUS INGREDIENTS

Substance: Crude oil

Other Designations: Petroleum; petroleum crude; coal oil; crude oil; rock oil, sweet petroleum crude - MC 252.

Components are listed in compliance with OSHA's 29 CFR 1910.1200. Trace amounts of hydrogen sulfide may be generated due to the sulfur content in the crude oil. There is not a direct correlation between hydrogen sulfide generation and the total sulfur content in this material.

Hazardous Component(s)	CAS Number	EC Number (EINECS)	Nominal Mass Concentration (%)
Crude oil	8002-05-9	232-298-5	98 – 100
<i>Individual Component(s)</i>			
<i>n</i> -Butane	106-97-8	203-448-7	0 – 5
<i>n</i> -Pentane	109-66-0	203-692-4	0 – 5
<i>n</i> -Hexane	110-54-3	203-777-6	0 – 6
Toluene	108-88-3	203-625-9	0 – 5
Xylene	1330-20-7	215-535-7	0 – 5
Benzene	71-43-2	200-753-7	0.1 – 1.8
Naphthalene	91-20-3	202-049-5	0 – 1
Ethylbenzene	100-41-4	202-849-4	0 – 0.4
Hydrogen Sulfide	7783-06-4	231-977-3	0 – 0.001

4. FIRST AID MEASURES

Description of First Aid Measures

Inhalation: If adverse effects occur, remove to uncontaminated area. Give artificial respiration if not breathing. Get immediate medical attention.

Skin Contact: Wash skin with soap and water for at least 15 minutes while removing contaminated clothing and shoes. Do not use hot water. Get medical attention, if needed. Thoroughly clean and dry contaminated clothing and shoes before reuse.

Eye Contact: Flush eyes with plenty of water for at least 15 minutes. Then get immediate medical attention.

Ingestion: DO NOT induce vomiting. If vomiting occurs, keep head lower than hips to help prevent aspiration. Get medical attention.

Most Important Symptoms/Effects, Acute and Delayed: Irritation, cough, difficulty breathing, dermatitis.

Indication of any immediate medical attention and special treatment needed, if necessary: If any of the above symptoms are present, seek immediate medical attention.

5. FIRE FIGHTING MEASURES

Fire and Explosion Hazards: Highly flammable liquid and vapor. Vapor/air mixtures are explosive above the flash point. See Section 9, "Physical and Chemical Properties" for flammability properties.

Extinguishing Media

Suitable: Regular dry chemical, carbon dioxide, water, or regular foam.

Unsuitable: Avoid using straight water streams in order to prevent frothing.

Specific Hazards Arising from the Chemical: Not applicable.

Special Protective Equipment and Precautions for Fire-Fighters: Move container from fire area if it can be done without personal risk. Avoid inhalation of material or combustion by-products. Wear full protective clothing and NIOSH-approved self-contained breathing apparatus (SCBA).

NFPA Ratings (0 = Minimal; 1 = Slight; 2 = Moderate; 3 = Serious; 4 = Severe)

Health = 2 Fire = 3 Reactivity = 0

6. ACCIDENTAL RELEASE MEASURES

Personal Precautions, Protective Equipment and Emergency Procedures: Use suitable protective equipment; see Section 8, "Exposure Controls and Personal Protection". Keep out of waters supplies and sewers.

Methods and Materials for Containment and Clean up: Avoid heat, flames, sparks and other sources of ignition. Stop leak if possible without personal risk; use water spray to reduce vapors. Absorb spilled material with sand or non-combustible material and collect in appropriate container for disposal.

7. HANDLING AND STORAGE

Safe Handling Precautions: See Section 8, "Exposure Controls and Personal Protection".

Storage and Incompatible Materials: Store in a well-ventilated area. Keep separated from incompatible substances (oxidizing materials).

8. EXPOSURE CONTROLS AND PERSONAL PROTECTION

Exposure Limits			
Components	OSHA (PEL)	ACGIH (TLV)	NIOSH (REL)
Crude Oil ^(a)	NOEL ^(b)	NOEL	TWA: 350 mg/m ³ Ceiling: 1800 mg/m ^{3(c)} IDLH: 1100 ppm ^(d)
<i>Individual components with occupational exposure limits.</i>			
<i>n</i> -Butane	NOEL	STEL: 1000 ppm	TWA: 1900 mg/m ³ (800 ppm)
<i>n</i> -Pentane	TWA: 2950 mg/m ³ (1000 ppm)	TWA: 1000 ppm	TWA: 350 mg/m ³ (120 ppm) Ceiling: 1800 mg/m ³ (610 ppm) ^(c) IDLH: 1500 ppm ^(d)
<i>n</i> -Hexane	TWA: 1800 mg/m ³ (500 ppm)	TWA: 50 ppm Skin ^(d)	TWA: 180 mg/m ³ (50 ppm) IDLH: 1100 ppm ^(d)
Toluene	TWA: 200 ppm Ceiling: 300 ppm	TWA: 20 ppm	TWA: 375 mg/m ³ (100 ppm) STEL: 560 mg/m ³ (150 ppm) IDLH: 500 ppm
Xylenes	TWA: 435 mg/m ³ (100 ppm)	TWA: 100 ppm STEL: 150 ppm	NOEL

Exposure Limits			
Components	OSHA (PEL)	ACGIH (TLV)	NIOSH (REL)
Benzene	TWA: 1 ppm STEL: 5 ppm ^(c) Ceiling: 25 ppm ^(c) Action level: 0.5 ppm ^(f)	TWA: 0.5 ppm STEL: 2.5 ppm Skin ^(e)	TWA: 0.1 ppm STEL: 1 ppm IDLH: 500 ppm
Naphthalene	TWA: 50 mg/m ³ (10 ppm)	TWA: 10 ppm Skin ^(d)	TWA: 50 mg/m ³ (10 ppm) STEL: 75 mg/m ³ (15 ppm) IDLH: 250 ppm
Ethylbenzene	TWA: 435 mg/m ³ (100 ppm)	TWA: 20 ppm	TWA: 435 mg/m ³ (100 ppm) STEL: 545 mg/m ³ (125 ppm) IDLH: 800 ppm ^(d)
Hydrogen Sulfide	Ceiling: 20 ppm	TWA: 1 ppm STEL: 5 ppm	Ceiling: 15 mg/m ³ (10 ppm) – 10 minutes IDLH: 100 ppm

^(a) The composition of these materials varies greatly. The content of benzene, other aromatics and additives should be determined individually.

^(b) NOEL: No occupational exposure limits established.

^(c) 15 minutes.

^(d) IDLH based off of 10 % LEL.

^(e) Skin – Potential significant contribution to overall exposure by the cutaneous route.

^(f) Cancer hazard, flammable, see 29 CFR 1910.1028.

Engineering Controls: Provide local exhaust or process enclosure ventilation system. Ensure compliance with applicable exposure limits.

Personal Protection Measures: In accordance with OSHA 29 CFR 1910.132, subpart I, wear appropriate Personal Protective Equipment (PPE) to minimize exposure to this material.

Respiratory Protection: If workplace conditions warrant a respirator, a respiratory protection program that meets OSHA 29CFR 1910.134 must be followed. Refer to NIOSH 42 CFR 84 for applicable certified respirators.

Eye Protection: Splash resistant safety goggles and emergency eyewash are recommended.

Skin and Body Protection: Chemical resistant clothing and gloves are recommended.

9. PHYSICAL AND CHEMICAL PROPERTIES

Descriptive Properties

Molar Mass (g/mol)
Molecular Formula
Appearance (physical state, color, etc.)
Odor
Odor threshold
pH
Evaporation rate
Melting point/freezing point
Density
Specific Gravity (water=1)
Vapor Pressure
Vapor Density (air = 1)
Viscosity
Kinematic Viscosity
Solubilities

Crude Oil

not applicable
not applicable
brown to black, liquid
slight smell of rotten eggs
not available
not available
not available
–60 °C to –20 °C (–76 °F to –4 °F)
not available
0.74 to 1.03
>0.36 kPa at 20 °C
not available
31 to 9000 SUS at 20 °C
not available
water: insoluble;
soluble in benzene, chloroform, ether and organic solvents.
not available

Partition coefficient (n-octanol/water)

Thermal Stability Properties

Autoignition Temperature 240 °C (464 °F) estimated (based on n-hexane)
Thermal Decomposition not available
Initial boiling point and boiling range 43.7 °C (110.7 °F)
Explosive Limits, LEL 1.1 %
Explosive Limits, UEL 5.9 %
Flash Point <15.6 °C (<60 °F)
Flammability (solid, gas) not applicable

10. STABILITY AND REACTIVITY

Reactivity: Stable at normal temperatures and pressure.

Stability: Stable Unstable

Possible Hazardous Reactions: Not applicable.

Conditions to Avoid: Avoid heat, flames, sparks, and other ignition sources. Avoid contact with incompatible materials. Containers may rupture or explode if exposed to heat. Keep out of water supplies and sewers. Dangerous gases may accumulate in confined spaces.

Incompatible Materials: Oxidizing materials.

Hazardous Decomposition: Oxides of carbon and sulfur.

Hazardous Polymerization: Will Occur Will Not Occur

11. TOXICOLOGICAL INFORMATION

Route of Exposure: Inhalation Skin Ingestion

Symptoms Related to the Physical, Chemical and Toxicological Characteristics: Irritation, cough, difficulty breathing, dermatitis.

Potential Health Effects (Acute, Chronic, and Delayed)

Inhalation: Irritation hazard is low unless heated or misted. Vapor or mist may cause irritation, headache, drowsiness, dizziness, loss of coordination. Prolonged contact may cause irritation.

Skin Contact: May cause skin disorders, dermatitis, and rash.

Eye Contact: Irritation, conjunctivitis.

Ingestion: May cause nausea vomiting, diarrhea, other gastrointestinal disturbances, and aspiration to the lungs may cause pneumonitis.

Numerical Measures of Toxicity

Components	Acute Toxicity
Crude Oil	Rat, Oral, LD50: >4300 mg/kg Rabbit, Dermal, LD50: >2000 mg/kg
<i>n</i> -Butane	Rat, Inhalation, LC50: 658 g/m ³ (4 h)
<i>n</i> -Pentane	Rat, Oral, LD50: >2000 mg/kg Rat, Inhalation, LC50: 364 g/m ³ (4 h) Rabbit, Dermal LD50: 3000 mg/kg
<i>n</i> -Hexane	Rat, Oral, LD50: 15 840 mg/kg Rat, Inhalation, LC50: 48 000 ppm (4 h) Rabbit, Dermal LD50: 3000 mg/kg
Toluene	Rat, Oral, LD50: 636 mg/kg Rat, Inhalation, LC50: 12.5 mg/L (4 h); 49 g/m ³ (4 h) Rabbit, Dermal LD50: 14 100 µL/kg
Xylene	Rat, Oral, LD50: 3500 mg/kg Rat, Inhalation, LC50: 5000 ppm (4 h) Rabbit, Dermal LD50: >1700 mg/kg
Benzene	Rat, Oral, LD50: 930 mg/kg; 1 mL/kg; 6400 mg/kg; 1800 mg/kg Rat, Inhalation, LC50: 13 050 ppm to 14 380 ppm (4 h) Rabbit, Dermal LD50: >9400 µL/kg
Naphthalene	Rat, Oral, LD50: 490 mg/kg Rat, Inhalation, LC50: >340 mg/m ³ (1 h) Rabbit, Dermal LD50: >20 g/kg
Ethylbenzene	Rat, Oral, LD50: 3500 mg/kg Rat, Inhalation, LC50: 17.2 mg/L (4 h) Rabbit, Dermal LD50: 15 400 mg/kg
Hydrogen Sulfide	Rat, Inhalation, LC50: 0.99 mg/L (1 h); 444 ppm (4 h)

Skin Corrosion/Irritation: Not classified.

Crude Oil, Human, open skin: 100 %; Rabbit, skin: 500 mg (24 h) – moderate

Toluene, Rabbit skin: 435 mg (24 h) – mild; 20 mg (24 h) – moderate; 500 mg – moderate

Xylene, Rabbit skin: 500 mg (24 h) – moderate; rabbit open skin: 60 µL (8 h) – mild

Ethylbenzene, Rabbit open skin: 15 mg (24 h) – mild

Naphthalene, Rabbit skin: 0.05 mL (24 h) – severe; rabbit open skin: 495 mg – mild

Benzene, Rabbit skin: 20 mg (24 h) - moderate; rabbit open skin: 15 mg (24 h) – mild

Serious Eye Damage/Eye Irritation: Not classified.

Crude Oil, Rabbit, eyes: 100 mg – mild

Toluene, Human eyes: 300 ppm; Rabbit eyes: 870 µg – mild

Xylene, Rabbit eyes: 87 mg – mild

n-Hexane, Rabbit eyes: 10 mg – mild; Vapors at 880 ppm for 15 min caused irritation.

Ethylbenzene, Rabbit eyes: 500 mg – severe

Naphthalene, vapor caused irritation at 15 ppm; crystalline naphthalene applied to rabbit eyes cleared and healed completely within 2 weeks.

Benzene, Rabbit eyes: 88 mg – moderate; 2 mg (24 h) - severe

Hydrogen sulfide, Human eyes: 0.000125 ppm (5 h)

Respiratory Sensitization: No data available.

Skin Sensitization: No data available.

Germ Cell Mutagenicity: Mutagenic Category 1B

Benzene: cytogenetic analysis, human inhalation: 0.1 ppm

Carcinogenicity: Category 1B

Listed as a Carcinogen/Potential Carcinogen X Yes No

IARC: Benzene is listed by IARC as Group 1, carcinogenic to humans; ethylbenzene and naphthalene are listed by IARC as Group 2b, possibly carcinogenic to humans; crude oil, toluene, and xylene are listed by IARC as Group 3, not classifiable.

NTP: Benzene is listed by NTP as known human carcinogen; naphthalene is listed by NTP as reasonably anticipated to be a human carcinogen.

OSHA: Benzene is on the list of OSHA identified carcinogens.

Reproductive Toxicity: Category 2

Crude oil, Rat, skin, TDLo: 200 mg/kg (pregnant 1 d to 19 d), 10 g/kg (pregnant 0 to 19 d)

Ethylbenzene, Rat, Inhalation, TCLo: 600 mg/m³ (24 h, pregnant 7 to 15 days); TCLo: 96 ppm (7 h, pregnant 1 to 19 days)

Toluene, Rat, Inhalation, TCLo: 1500 ppm (7 to 20 days pregnant)

Benzene, Rat Inhalation, TCLo: 50 ppm (24 h, 7 to 14 days pregnant)

Specific Target Organ Toxicity, Single Exposure (STOT): No data available.

STOT, Single Exposure: Category 3, Central Nervous System Depressant

The individual components have shown central nervous system depressant effects.

Specific Target Organ Toxicity, Repeated Exposure: No data available.

STOT, Repeated Exposure: Category 1

Benzene may affect blood and kidney systems.

Aspiration Hazard: Category 1

Crude oil and individual components (toluene, n-hexane, n-pentane, ethylbenzene, and benzene) are aspiration hazards.

12. ECOLOGICAL INFORMATION

Ecotoxicity Data

Components	Aquatic Toxicity
Crude Oil	Invertebrate: 48 Hr EC50 Freshwater water flea (<i>Daphnia magna</i>): <0.26 mg/L [static]
Toluene	Fish: 96 Hr LC50 Rainbow trout (<i>Oncorhynchus mykiss</i>): 5.8 mg/L [semi-static] Algae: 96 Hr EC50 <i>Pseudokirchneriella subcapitata</i> : >433 mg/L [static] Invertebrate: 48 Hr EC50 Freshwater water flea (<i>Daphnia magna</i>): 5.46-9.83 mg/L
Xylene	Fish: 96 Hr LC50 Fathead minnow (<i>Pimephales promelas</i>): 13.4 mg/L [flow-through] Invertebrate: 48 Hr EC50 Freshwater water flea (<i>Daphnia magna</i>): 3.82 mg/L
n-Hexane	Fish: 96 Hr LC50 Fathead minnow (<i>Pimephales promelas</i>): 2.1-2.98 mg/L [flow-through]
n-Pentane	Fish: 96 Hr LC50 Rainbow trout (<i>Oncorhynchus mykiss</i>): 9.87 mg/L Invertebrate: 48 Hr EC50 Freshwater water flea (<i>Daphnia magna</i>): 9.74 mg/L
Ethylbenzene	Fish: 96 Hr LC50 Fathead minnow (<i>Pimephales promelas</i>): 7.55-11 mg/L [flow-through] Algae: 96 Hr EC50 <i>Pseudokirchneriella subcapitata</i> : 1.7 to 7.6 mg/L [static] Invertebrate: 48 Hr EC50 Freshwater water flea (<i>Daphnia magna</i>): 1.8 mg/L to 2.4 mg/L
Naphthalene	Fish: 96 Hr LC50 Fathead minnow (<i>Pimephales promelas</i>): 5.74-6.44 mg/L [flow-through] Invertebrate: 48 Hr EC50 Freshwater water flea (<i>Daphnia magna</i>): 1.96 mg/L [flow-through]

Components	Aquatic Toxicity
Benzene	Fish: 96 Hr LC50 Rainbow trout (<i>Oncorhynchus mykiss</i>): 5.3 mg/L [flow-through] Algae: 72 Hr EC50 <i>Pseudokirchneriella subcapitata</i> : 29 mg/L Invertebrate: 48 Hr EC50 Freshwater water flea (<i>Daphnia magna</i>): 9–16 mg/L [static]
Hydrogen Sulfide	Fish: 96 Hr LC50 Fathead minnow (<i>Pimephales promelas</i>): 0.016 mg/L [flow-through]

Persistence and Degradability: No data available.

Bioaccumulative Potential: Bioconcentration factors: xylene (0.6 to 15), ethylbenzene (15, species fish), naphthalene (30 to 430, species fish), benzene (3.5 to 4.4, species fish), hydrogen sulfide (no bioaccumulation expected).

Mobility in Soil: No data available.

Other Adverse effects: No data available.

13. DISPOSAL CONSIDERATIONS

Waste Disposal: Dispose in accordance with all applicable federal, state, and local regulations. Subject to hazardous waste regulations US EPA 40 CFR 262:

Crude Oil	Hazardous waste number D001.
Toluene	Hazardous waste number U220.
Xylene	Hazardous waste number U239, ignitable waste.
Naphthalene	Hazardous waste number U165, ignitable waste.
Benzene	Hazardous waste number U019, ignitable waste, toxic waste, regulatory level 0.5 mg/L.
Hydrogen Sulfide	Hazardous waste number U135.

14. TRANSPORTATION INFORMATION

U.S. DOT and IATA: UN1267; Petroleum Crude Oil; Hazard Class 3; Packing Group II.

15. REGULATORY INFORMATION

U.S. Regulations

CERCLA Sections 102a/103 (40 CFR 302.4): Final RQ listed below.

Toluene:	1000 lbs (454 kg)
Xylene:	100 lbs (45.4 kg)
n-Hexane:	5000 lbs (2270 kg)
Ethylbenzene:	1000 lbs (454 kg)
Naphthalene:	100 lbs (45.4 kg)
Benzene:	10 lbs (4.54 kg)
Hydrogen sulfide:	100 lbs (45.4 kg)

SARA Title III Section 302 (40 CFR 355.30): Hydrogen sulfide, 500 lbs TPQ

SARA Title III Section 304 (40 CFR 355.40): Hydrogen sulfide, 100 lbs EPCRA RQ

SARA Title III Section 313 (40 CFR 372.65):

Toluene:	1.0 % de minimis concentration
Xylene:	1.0 % de minimis concentration
n-Hexane:	1.0 % de minimis concentration
Ethylbenzene:	0.1 % de minimis concentration
Naphthalene:	0.1 % de minimis concentration
Benzene:	0.1 % de minimis concentration
Hydrogen sulfide:	1.0 % de minimis concentration

OSHA Process Safety (29 CFR 1910.119): Hydrogen sulfide, 1500 lbs TQ

SARA Title III Sections 311/312 Hazardous Categories (40 CFR 370.21):

ACUTE HEALTH:	Yes
CHRONIC HEALTH:	Yes
FIRE:	Yes
REACTIVE:	No
PRESSURE:	No

State Regulations

California Proposition 65:

WARNING! This product contains chemicals (benzene, toluene) known to the state of California to cause reproductive developmental effects.

WARNING! This product contains chemicals (benzene, naphthalene, ethylbenzene) known to the state of California to cause cancer.

U.S. TSCA Inventory: Crude oil, *n*-butane, toluene, xylenes, *n*-hexane, *n*-pentane, ethylbenzene, naphthalene, hydrogen sulfide, and benzene are listed.

TSCA 12(b), Export Notification: None listed.

Canadian Regulations: WHMIS information is not provided for this material.

16. OTHER INFORMATION

Issue Date: 02 March 2021

Sources: BP America Production Co., *Sweet Petroleum Crude Oil – MC 252*; 14 August 2010.
ChemADVISOR, Inc., SDS *Petroleum-Crude Oil (Untreated and Mildly-Treated)*, 09 December 2015.
ChemADVISOR, Inc., SDS *Benzene*, 09 December 2015.
ChemADVISOR, Inc., SDS *n-Butane*, 10 September 2014.
ChemADVISOR, Inc., SDS *Ethyl Benzene*, 09 December 2015.
ChemADVISOR, Inc., SDS *n-Hexane*, 09 December 2015.
ChemADVISOR, Inc., SDS *Xylene*, 09 December 2015.
ChemADVISOR, Inc., SDS *Naphthalene*, 09 December 2015.
ChemADVISOR, Inc., SDS *Pentane*, 09 December 2015.
ChemADVISOR, Inc., SDS *Toluene*, 09 December 2015.
ChemADVISOR, Inc., SDS *Hydrogen Sulfide*, 09 December 2015.
NIOSH, CDC Pocket Guide; *n-Butane*; 31 October 2019; available at <https://www.cdc.gov/niosh/npg/npgd0068.html> (accessed Mar 2021)
PubChem, National Library of Medicine; *Butane*; available at <https://pubchem.ncbi.nlm.nih.gov/compound/Butane> (accessed Mar 2021)

Key of Acronyms:

ACGIH	American Conference of Governmental Industrial Hygienists	NTP	National Toxicology Program
CAS	Chemical Abstracts Service	OSHA	Occupational Safety and Health Administration
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act	PEL	Permissible Exposure Limit
CFR	Code of Federal Regulations	RCRA	Resource Conservation and Recovery Act
DOT	Department of Transportation	REL	Recommended Exposure Limit
EINECS	European Inventory of Existing Commercial Chemical Substances	RQ	Reportable Quantity
EPCRA	Emergency Planning and Community Right-to-Know Act	RTECS	Registry of Toxic Effects of Chemical Substances
IARC	International Agency for Research on Cancer	SARA	Superfund Amendments and Reauthorization Act
IATA	International Air Transport Agency	SCBA	Self-Contained Breathing Apparatus
IDLH	Immediately Dangerous to Life and Health	SRM	Standard Reference Material
LC50	Lethal Concentration	STEL	Short Term Exposure Limit
LD50	Median Lethal Dose or Lethal Dose, 50 %	TLV	Threshold Limit Value
LEL	Lower Explosive Limit	TPQ	Threshold Planning Quantity
MSDS	Material Safety Data Sheet	TSCA	Toxic Substances Control Act
NFPA	National Fire Protection Association	TWA	Time Weighted Average
NIOSH	National Institute for Occupational Safety and Health	UEL	Upper Explosive Limit
NIST	National Institute of Standards and Technology	WHMIS	Workplace Hazardous Materials Information System

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