SAFETY DATA SHEET (SDS)

SDS in accordance with UN GHS Purple Book **CAP – SDS – 03 - Crude C4 (Rev.01)**

This SDS is effective as from 25 Jan 2019 and supersedes previous document published | Validity date: 25 Jan 2024

SECTION-1. IDENTIFICATION

Product/Material	:	**Crude C4**
Recommended Use	:	Raw material use in petrochemicals applications. For example: extraction of 1,3 butadiene and manufacturing styrene butadiene rubber (SBR) and methyl tertiary butyl ether (MTBE)
Manufacturer	:	**PT. CHANDRA ASRI PETROCHEMICAL Tbk (CAP)**
Head Office	:	Wisma Barito Pacific, Tower A, 7th floor, Jl. Letjend S. Parman, Kav.62-63. Jakarta 11410, Indonesia.
Plant	:	Jl Raya Anyer Km.123, Ciwandan, Cilegon 42447, Indonesia. Ph: 62-254-601501
Emergency contact (24 hrs)	:	GROUPSHEDIVISION@capcx.com, Ph: 62-254-601829, 601501 Ext 1232
Additional Information	:	GROUPRND@capcx.com, Phone: +62-254-601501 Ext 1309, 1616

SECTION-2. HAZARD IDENTIFICATION

GHS Classification	:	Flammable Gas: Category 1 | Refrigerated liquefied gases | Narcotic Effects
Hazard statements	:	Extremely flammable liquid and vapor | Contains gas under pressure; may explode if Heated | Toxic to aquatic life with long lasting effects | May be fatal if swallowed and enters airways | Harmful if swallowed | May cause cancer | May cause genetic defects | May damage fertility or the unborn child | Causes serious eye irritation | Causes skin irritation | May cause drowsiness or dizziness | May cause respiratory irritation.
Pictogram (Hazard Symbols)	:	
Signal Word	:	DANGER
NFPA Hazard Rating	:	Health = 2 Flammability = 4 Reactivity = 2
Precautionary Statements	:	Obtain special instructions before use | Do not handle until all safety precautions have been read and understood | Keep away from heat/sparks/open flames/hot surfaces – No Smoking | Keep container tightly closed | Keep cool | Ground/bond container and receiving equipment | Use explosion - proof electrical/ventilating/ lighting/equipment | Use only non-sparking tools | Take precautionary measure against static discharge | Wear protective gloves/protective clothing/eye protection/face protection | Use personal protective equipment as required | Do not eat, drink or smoke when using this product | Wash thoroughly after handling | Avoid release to the environment.

SECTION-3. COMPOSITION / INFORMATION ON INGREDIENTS

Chemical Identity	:	Crude C4	CAS No: 74-85-1
Common Name	:	Crude C4	
Concentration	:	≥ 99.9 %wt	Impurities : ≤0.1%wt

Component		CAS No	Concentration (% wt.)
C4 Fraction	:	68476-52-8	99.0 – 100.0
1,3 Butadiene	:	106-99-0	38.0 – 50.0
1,2 Butadiene	:	590-19-2	0.1 – 0.4
Isobutene	:	115-11-7	18.0 – 28.0
Butene-1	:	106-98-9	13.0 – 20.0
t-2-Butene	:	624-64-6	4.0 – 6.0
c-2-Butene	:	590-18-1	3.0 – 5.0
n-Butane	:	106-97-8	1.6 – 5.7
Isobutane	:	75-28-5	0.5 – 2.4
VA	:	689-97-4	0.6 – 1.0
EA	:	107-00-6	0.1 – 0.2
C5+	:	N/A	0.0 – 3.1
C3's	:	N/A	0.0 – 0.5

SECTION-4. FIRST-AID MEASURES

General : Move out of dangerous area. Show this material safety data sheet to the doctor in attendance. Material may produce a serious, potentially fatal pneumonia if swallowed or vomited.

Skin : Thaw frostbite slowly with lukewarm water. DO NOT RUB affected area. Do not pull off adherent clothing or objects. Seek medical attention at once.

Inhalation : Remove person to fresh air. Loosen tight clothing such as a collar, tie, belt or waistband. If not breathing administer artificial respiration. If breathing is difficult, administer oxygen. Obtain prompt medical attention.

Eyes : Flush eyes with plenty of water for several minutes. Seek medical Attention immediately

Ingestion : DO NOT induce vomiting. Examine the lips and mouth to ascertain whether the tissues are damaged. Thaw frostbite in mouth slowly with lukewarm water, ensuring that the conscious effected individual does not gag or choke. Loosen tight clothing such as a collar, tie, belt or waistband. If the individual is not breathing qualified personnel should perform mouth to mouth resuscitation. Seek immediate medical attention.

Note to Physician : Treat unconsciousness, frostbite, nausea, hypotension, seizures and cardiac arrhythmia in the conventional manner. Administer oxygen by mask if there is respiratory distress. Treatment of overexposure should be direct at controlling the symptoms and clinical condition of a patient. After adequate first aid, no further treatment is necessary unless symptoms reappear.

SECTION-5. FIRE-FIGHTING MEASURES

Flammable Properties : Fire and container explosion hazard are extremely high when this product is exposed to heat or flame. Use massive Quantity of water to cool fire-exposed containers. Immediately withdraw in case of fire and container venting or heat is coloration of containers. Vapors are heavier than air and may travel to some distant source of ignition and flash back. Consider immediately emergency isolation and evacuation. Do not attempt to extinguish a gas fire unless leak source can be isolated and shut off. Be aware of possibility re-ignition. If a pipe line, storage vessel, rail car or tank truck is possibly ruptured or involved in a fire, isolate for 1600 meters (1 mile) in all directions, also consider for evacuation for 1600 meters (1 mile) from all directions.

Extinguishing Media

Suitable Extinguishing Media	:	Alcohol-resistant foam. Carbon dioxide (CO_2). Dry chemical.
Unsuitable Extinguishing Media	:	Do not use water jet.

Specific Hazards in Case of Fire

Hazardous Combustion Products	:	Upon combustion, this products emits carbon monoxide, carbon dioxide, and/or low molecular weight hydrocarbons.

Special Protective Equipment and Precaution for Fire Fighter

Special Protective Equipment	:	Full-face self-contained breathing apparatus, thermal protective clothing.
Precautions for Fire- Fighter	:	Keep unnecessary personnel away. Pipeline and container explosion hazards are extremely high when this product had exposed to heat or flame. May explode when heated or involved in a fire. Use massive quantities of water to cool fire-exposed pipelines or containers. Immediately withdraw in case of fire and tank venting or heat discoloration of a tank. Vapors may travel to some distant source of ignition and flash back. Be aware of possibility re-ignition. When pressure in a container needs to be controlled, consider setting up emergency isolation and evacuation for at least 800m. If tank is involved in a fire, ISOLATE for 1,600m in all directions. Let uncontrolled fires burn off. Fire fighter should wear full-face, self-contained breathing apparatus and thermal protective clothing. Avoid inhaling any smoke and combustion materials Remove and clean or destroy any contaminated clothing. Cools containers with flooding quantities of water until well after the fire is out. Control runoff waters to prevent entry into ditches, sewers, drains, underground or confined spaces and waterways

SECTION-6. ACCIDENTAL RELEASE MEASURES

Personal Precautions	:	Wear self-contained breathing apparatus when entering area unless atmosphere is prove safe.
Environmental Precautions	:	Avoid entry of product into drains, sewers, or waterways
Methods and Materials for Containment and Cleaning up	:	Evacuate area. Ensure adequate air ventilation. Do not touch spilled material. No smoking or open flames permitted in storage, use or handling areas. Eliminate ignition sources. Dissipate static electricity during transfer or processing by proper earthing (grounding) and bonding of containers and equipment.

SECTION-7. HANDLING AND STORAGE

Precautions for Safe Handling	:	Keep locked up or secured. Handle in fully enclosed, grounded, properly designed and approved liquefied pressurized gas systems. Keep away from heat and ignition sources. Procedures and design should exclude oxygen from the handling and processing systems. Use with adequate ventilation. Avoid contact with eye and skins. Avoid breathing gas or vapors. Keep away from uncontrolled heat, ignition source and incompatible materials. Wear suitable protective equipment including thermally protective gloves. No smoking or open flames permitted in storage, use or handling areas. Take special precautions when breaking into lines. Equipment and piping may required treatment (decontamination) prior to exposure to air for maintenance or disposal/salvage. Equipment preparation may include Nitrogen purge, acid wash (to remove iron oxides), sodium nitrite pacification, and final oxygen removal using diethylhydroxylamine (DEHA) or suitable materials.
Conditions for Safe Storage, including Incompatibilities	:	Storage area should be clearly identified, well illuminated, clear obstruction and accessible to Only trained and authorized personnel. Ground all material handling and transfer equipment to dissipate build up static electricity. Storage, shipping and

processing required review of risk and use suitable inhibitor such as t-butyl catechol (TBC), EC3071A or equivalent.

See Section 8: Exposure Controls/Personal Protection for appropriate Personal Protective Equipments. See Section 10 for information on Incompatibilities.

SECTION-8. EXPOSURE CONTROLS / PERSONAL PROTECTION

Information on the System Design:

Engineering methods include mechanical ventilation (dilution and local exhaust) process or personal enclosure, remote and automated operation, control of process conditions, leak detection and repair systems, and other process modifications. Ensure all exhaust ventilation system are discharge to outdoors, away from air intakes and ignition sources. Supply sufficient replacement air to make up for air removed by exhaust systems. Administrative (procedure) controls and use of personal protective equipment may also be required. Personal protective equipment should not be considered a long-term solution to exposure control. Persons in ill health where such illness would be aggravated by exposure to product should not be allowed to work with or handle this product.

Exposure Limits

Component Name (CAS No)	Reference	TWA		STEL	
		ppm	mg/m^3	ppm	mg/m^3
1,3 Butadiene	ACGIH	2	4.4		
	OSHA Z-1	1		5	
n-Butane	ACGIH	1000			
Butene-1	ACGIH	250			
1,2-Butadiene					
Trans-2 Butene	ACGIH	250			
	Ontario	250			
Cis-2 Butene	ACGIH	250			
	Ontario	250			
Iso-Butene					

Ventilation : Control airborne concentrations below the exposure guidelines.

Respiratory Protection : If engineering controls and ventilation is not sufficient to prevent build-up of aerosols or vapor and/or oxygen concentrations are low, appropriate air supplied breathing apparatus should be use.

Hand Protection : Use impervious gloves designed to prevent freezing of body tissues if contact with liquefied gas is possible. Wear chemical-resistant safety footwear with good traction to prevent slipping.

Eyes Protection : Wear safety glasses. Use of chemical goggles under a full-face shield is recommended if contact with liquefied vapor is possible.

Skin Protection : Work clothing that sufficiently prevents skin contact and prevents freezing of body tissues if contact with liquefied gas is possible should been worn, such as coveralls and/or long sleeves and pants. Fire resistant (i.e., Nomex) or natural fibber clothing (i.e., cotton or wool) is recommended. Synthetic clothing can generate static electricity and would not recommend where flammable vapor releases may occur.

SECTION-9. PHYSICAL AND CHEMICAL PROPERTIES

Physical State and Appearance	Gas at ambient conditions, liquid under pressure	Oxidizing Properties	May react with strong oxidizing agents.
Color	Colorless	Evaporation Rate	Not Applicable
Odor	Gassy/Aromatic	Vapor Pressure	2 atm at $15.3^{O}C$ ($59.5^{O}F$) (1,3-butadiene)
Odor Threshold	Detectable at 0.45 ppm/1.0 mg/m^3 (1,3-butadiene)	Explosive Properties	Gas/air mixtures are explosive
pH	Not Applicable	Viscosity	1.06 cSt at $-170^{O}C$

Boiling Point/Boiling Range	-12^{O}C to 4^{O}C (10.4^{O}F to 39.2^{O}F)
Melting Point Flash Point	-108.9^{O}C (-164^{O}F) at 101.3kPa (1,3-butadiene) -77^{O}C (1,3-butadiene)
Auto-ignition	414^{O}C (777.2^{O}F) (1,3-butadiene)
Flammable Classification	Extremely Flammable
Lower Flammable (explosion) Limit	2% (1,3-butadiene).
Upper Flammable (explosion) Limit	11.5% (1,3-butadiene).

Specific gravity (water=1)	Range: 0.60 to 0.61 at 15^{O}C (60^{O}F) (calculated)
Solubility (water)	Largely insoluble in hot, cold water, reported 735 ppm at 22^{O}C (71.6^{O}F) (1,3butadiene)
Partition Coefficient Octanol/Water Log Pow)	Range: 2.09 to 2.31
Evaporation	Immediate at 20^{O}C
Relative Vapor Density (air=1)	1.9 (1.3- Butadiene)
Additional Physical and Chemical properties	No additional information available

SECTION-10. STABILITY AND REACTIVITY

Chemical Stability : This product is UNSTABLE. May form acetylides with copper, silver, mercury or alloys that are explosive and very hazardous when dry.

Possibility of Hazardous reaction & Hazardous Polymerization : Risk of hazardous polymerization increase with the concentration of 1,3 butadienes. Storage and processing requires review of risks and use of suitable inhibitors such as fert-butyl catechol (TBC) or equivalent.

Conditions to Avoid : Keep away from heat, spark, or open flame.

Substances to Avoid : Product can react with water to form hydrates. Avoid strong acids, strong oxidizing agents, chlorine, halogens, organic peroxides, ozone and nitrogen dioxide. Many materials become brittle after contact with liquefied gases and hoses periodically to ensure integrity and compatibility.

Hazardous Decomposition Products : Upon decomposition, this product emits carbon monoxide, carbon dioxide and/or low molecular weight hydrocarbons.

Special Remarks : Vapors may form an explosive mixture with air. May polymerize explosively when heated or involved in a fire. May react vigorously with oxidizing agents. Liquefied gas may explode on contact with hot water (45^{O}C – 75^{O}C).

SECTION-11. TOXICOLOGICAL INFORMATION

Acute Toxicity : This product is not considered acutely toxic. At very high exposure, it produces an anesthetic effect. Excessive exposure may cause headache, dizziness, nausea, loss of coordination, and in extreme conditions coma and possible death. The liquefied form will cause freezing burns (frostbite) to the eyes and skin. For 1,3 Butadiene which is the main component of this material. May cause irritation of the eyes. Contact can irritate the skin and may cause frostbite. Inhalation irritates the respiratory tract causing coughing and wheezing. DANGER! Inhalation cause drowsiness, light headacheness, unconsciousness, and at very high exposure death.

4h inhalation-rat LC50 : 285,000 mg/m^3

Repeated Dose Toxicity : Ethylene is relatively inactive biologically and essentially non-toxic; therefore, the major hazard is the exclusion of an adequate supply of oxygen to the lungs. Inhalation of ethylene by Sprague Dawley rats, in concentrations of 0, 300, 1000, 3000 and 10,000 ppm, 6 hours/day, 5 days/week for 14 weeks, were not found to cause any toxic effects.

Carcinogenicity : **1,3 Butadiene**

EPA : Group 3 – Not classified as human carcinogen │ ACGIH : A2 (Suspected Human Carcinogen) │ IARC: Group1 (Carcinogenic to humans) │ OHSA-Proven for humans │ NTP-Classified 1 – Known human carcinogen

Special Remarks on Other Toxic Effect on Humans	:	The substance may effect on the bone marrow, resulting in leukaemia. This substance is probably carcinogenic to human. May cause heritable genetic damage in humans. Animal test show that this substance possibly causes toxic effect upon human reproduction. Repeated exposures may cause injury to lungs, liver and kidney.

SECTION-12. ECOLOGICAL INFORMATION

Eco toxicity – Acute Toxicity	:	**Fish:** LC50: 43 mg/l 96 h | **Daphnia magna:** LC50 24 mg/l 96 h | **Green algae:** EC50 11 mg/l
Mobility	:	Modeling indicates that the product will distribute 99.97 into air, 0.03% into water, and < 0.01% into soil, sediment, suspended sediment and biota. For butadiene, the log Kow is 1.99, the estimated soil absorption coefficient is 288 and the log Koc is estimated between 1.86 to 2.36, indicating some mobility in soil. Components are not expected to hydrolyze in water
Persistence and Degradability		
Air	:	Components are not expected to be persistent in the air. Airborne degradation by product of butadiene may induce adverse health effects. Product will photo chemically react.
Soil	:	Mixture will distribute 99.9% into air and virtually no distribution into soil, sediment.
Water	:	Mixture will distribute 99.9% into air with some ppm into water.
Bioaccumulation Potential	:	The log Kow = 1.99 for 1,3 Butadiene, this product is not expected to bio concentrate
Biodegradation Potential	:	Biodegradation is likely to occur. Biodegradation has found to rapidly occur to constituent chemicals at variable rates based on environmental conditions and not persist.
Environmental Adverse Effects	:	The product has not classified as dangerous for environment. The product evaporates readily exposure to aquatic life is expected to be minimal

SECTION-13. DISPOSAL CONSIDERATIONS

This product as sold is ignitable and if disposed of would be considered a hazardous waste. The use, mixing or processing of this product may alter this product. Contact federal, state and local authorities in order to generate or ship a waste, material associated with this product to ensure materials are handled appropriately and meet all criteria for disposal of hazardous waste.

SECTION-14. TRANSPORT INFORMATION

UN Number	1010	
UN Proper Shipping name	Butadiene, Stabilized	
Transport Hazard Class	Road (ADR)/Rail (RID)/Water (ADNR)	2 (2.1 flammable gas)
	IMDG class (Marine Transport)	2 (2.1 flammable gas)
	ICAO/IATA class (Air Transport)	2 (2.1 flammable gas)
Packing Group	None	
Marine Pollutant	No	

SECTION-15. REGULATORY INFORMATION

Regulatory Information	:	PERMENLH RI No. 3 Year 2008: Tata Cara Pemberian Simbol dan Label Bahan Berbahaya dan Beracun. PERMENPERIN RI No. 87/M-IND/PER/9/2009: Sistem Harmonisasi Global Klasifikasi dan Label pada Bahan kimia. KEPMENAKER 187/Men/1999 Pengendalian Bahan Kimia Berbahaya

SECTION-16. OTHER INFORMATION

Training Advice	:	Personnel handling the product need to be demonstrably with its hazardous properties, with health and environmental protection principles related to the product and first aid principles
Recommended Uses	:	THE PRODUCT IS RESTRICTED TO PROFESSIONAL USAGE. Ensure all national regulations are observed. Ensure operators understand the flammability hazard. The hazard of asphyxiation is often overlooked and must be stressed during operator training. Whilst proper care has been taken in the preparation of this document, no liability for injury or damage resulting from its use can be accepted. Although reasonable care has been taken in the preparation of this document, we extend no warranties and make no representations as to the accuracy or completeness of the information contained herein, and assume no responsibility regarding the suitability of this information for the user's intended purposes or for the consequences of its use. Each individual should make a determination as to the suitability of the information for their particular purpose.

Abbreviations that may have been used in this document:

ACGIH	:	American Conference of Governmental Industrial Hygienist
ADNR	:	European Agreement concerning the Int'l Carriage of Dangerous Goods by inland Waterways
ADR	:	European Agreement concerning the Int'l Carriage of Dangerous Goods by Road
CAS	:	Chemical Abstract Service
EPA	:	Environmental Protection Agency
EU	:	European Union
IATA	:	International Air Transport Association
ICAO	:	International Civil Aviation Organization
IMDG	:	International Maritime Dangerous Goods
IMO	:	International Maritime Organization
LC50	:	Lethal Concentration, concentration of chemical which kills 50% of a sample population
LD50	:	Lethal Dose, dose of a chemical which kills 50% of a sample population
NFPA	:	National Fire Protection Association
NTP	:	National Toxicology Program
PSHA	:	Occupational Safety and Health Administration
RID	:	International Rule for Transportation of Dangerous Substance by Railway
TLV	:	Threshold Limit Value
TWA	:	Time Weighted Averages

This Safety Data Sheet (SDS) contains the following historical revisions:

Rev No	Issued Date	Revision Change	Description
00	09 Jan 2015	Original Document	
01	25 Jan 2019	SECTION-02	NFPA was modified

THE INFORMATION EXPRESSED HEREIN IS THOSE OF QUALIFIED CURRENT KNOWLEDGE AND EXPERIENCE ANT THAT THE INFORMATION IS SUFFICIENT OF ALL CASES. USERS SHOULD CONSIDER THE DATA AS A SUPPLEMENT TO OTHER INFORMATION AND SHOULD MAKE INDEPENDENT DETERMINATION OF ITS SUITABILITY, THEIR EMPLOYEES AND CUSTOMERS AND OF THE ENVIRONMENTAL PROTECTION TO ASSURE PROPER USE AND DISPOSAL OF THE MATERIAL. RESPONSIBILITY FOR USAGE, STORAGE, HANDLING AND DISPOSAL OF THE PRODUCTS DESCRIBED HEREIN, WHETHER ALONE, OR IN COMBINATION WITH ANY OTHER SUBSTANCE, IS THAT OF THE PURCHASER AND/OR END-USER. ***CAP*** *MAKES NO WARRANTY, EXPRESSED OR IMPLIED REGARDING THE ACCURACY OF THESE DATA OR THE RESULT TO BE OBTAINED FROM THE USE THEREOF.* ***CAP*** *ASSUMES NO RESPONSIBILITY FOR INJURY FROM THE USE OF THE PRODUCT DESCRIBED HEREIN.*