



# Material Safety Data Sheet

The Dow Chemical Company

**Product Name:** CYCLOTENE\* 4024 - 40 Advanced Electronics Resin

**Issue Date:** 04/12/2006

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The Dow Chemical Company encourages and expects you to read and understand the entire (M)SDS, as there is important information throughout the document. We expect you to follow the precautions identified in this document unless your use conditions would necessitate other appropriate methods or actions.

## 1. Product and Company Identification

### Product Name

CYCLOTENE\* 4024 - 40 Advanced Electronics Resin

### COMPANY IDENTIFICATION

The Dow Chemical Company  
2030 Willard H. Dow Center  
Midland, MI 48674  
USA

Customer Information Number: 800-258-2436

### EMERGENCY TELEPHONE NUMBER

**24-Hour Emergency Contact:** 989-636-4400

**Local Emergency Contact:** 989-636-4400

## 2. Hazards Identification

### Emergency Overview

**Color:** Yellow

**Physical State:** Liquid

**Odor:** Aromatic

### Hazards of product:

**WARNING!** Causes eye irritation. May cause skin irritation. May cause allergic skin reaction. May be harmful if inhaled. May cause respiratory tract irritation. May cause anesthetic effects. Aspiration hazard. Can enter lungs and cause damage. Combustible liquid and vapor. Isolate area. Vapor explosion hazard. Vapors may travel a long distance; ignition and/or flash back may occur. Stay out of low areas. Avoid temperatures above 40°C (104°F)

### OSHA Hazard Communication Standard

This product is a "Hazardous Chemical" as defined by the OSHA Hazard Communication Standard, 29 CFR 1910.1200.

### Potential Health Effects

**Eye Contact:** May cause moderate eye irritation. May cause moderate corneal injury. Vapor may cause eye irritation experienced as mild discomfort and redness.

\* Indicates a Trademark

**Skin Contact:** Prolonged contact may cause skin irritation with local redness. Repeated contact may cause skin burns. Symptoms may include pain, severe local redness, swelling, and tissue damage. May cause drying and flaking of the skin. May cause more severe response on covered skin (under clothing, gloves).

**Skin Absorption:** Prolonged skin contact is unlikely to result in absorption of harmful amounts.

**Skin Sensitization:** A component in this mixture has caused allergic skin reactions in humans.

**Inhalation:** Vapor concentrations are attainable which could be hazardous on single exposure.

Excessive exposure may cause irritation to upper respiratory tract (nose and throat) and lungs.

Symptoms of excessive exposure may be anesthetic or narcotic effects; dizziness and drowsiness may be observed.

**Ingestion:** Low toxicity if swallowed. Small amounts swallowed incidentally as a result of normal handling operations are not likely to cause injury; however, swallowing larger amounts may cause injury. Aspiration into the lungs may occur during ingestion or vomiting, causing lung damage or even death due to chemical pneumonia.

**Effects of Repeated Exposure:** Contains component(s) which have been reported to cause effects on the following organs in animals: Liver. Lung. Central nervous system. Blood.

**Birth Defects/Developmental Effects:** Contains component(s) which caused birth defects in laboratory animals only at doses toxic to the mother. Contains component(s) which, in laboratory animals, have been toxic to the fetus only at doses toxic to the mother.

**Reproductive Effects:** In animal studies on component(s), effects on reproduction were seen only at doses that produced significant toxicity to the parent animals.

### 3. Composition Information

Component	CAS #	Amount
B-Staged divinylsiloxane-bis-benzocyclobutene resin	124221-30-3	>= 26.0 - <= 44.0 %
1,3,5-Trimethylbenzene	108-67-8	>= 50.0 - <= 73.0 %
Quinoline, 1,2-dihydro-2,2,4-trimethyl-, polymers	26780-96-1	>= 0.3 - <= 3.1 %
2,6-Bis((4-azidophenyl)methylene)-4-ethylcyclohexanone	114391-97-8	>= 0.3 - <= 2.7 %

### 4. First-aid measures

**Eye Contact:** Immediately flush eyes with water; remove contact lenses, if present, after the first 5 minutes, then continue flushing eyes for at least 15 minutes. Obtain medical attention without delay, preferably from an ophthalmologist.

**Skin Contact:** Remove material from skin immediately by washing with soap and plenty of water. Remove contaminated clothing and shoes while washing. Seek medical attention if irritation persists. Wash clothing before reuse. Discard items which cannot be decontaminated, including leather articles such as shoes, belts and watchbands.

**Inhalation:** Move person to fresh air. If not breathing, give artificial respiration; if by mouth to mouth use rescuer protection (pocket mask, etc). If breathing is difficult, oxygen should be administered by qualified personnel. Call a physician or transport to a medical facility.

**Ingestion:** Do not induce vomiting. Call a physician and/or transport to emergency facility immediately.

**Notes to Physician:** If lavage is performed, suggest endotracheal and/or esophageal control. Danger from lung aspiration must be weighed against toxicity when considering emptying the stomach. The decision of whether to induce vomiting or not should be made by a physician. Respiratory symptoms, including pulmonary edema, may be delayed. Persons receiving significant exposure should be observed 24-48 hours for signs of respiratory distress. Maintain adequate ventilation and oxygenation of the patient. If burn is present, treat as any thermal burn, after decontamination. No specific antidote. Treatment of exposure should be directed at the control of symptoms and the clinical condition of the patient.

**Medical Conditions Aggravated by Exposure:** Skin contact may aggravate preexisting dermatitis.

## 5. Fire Fighting Measures

**Extinguishing Media:** Water fog or fine spray. Dry chemical fire extinguishers. Carbon dioxide fire extinguishers. Foam. General purpose synthetic foams (including AFFF type) or protein foams are preferred if available. Alcohol resistant foams (ATC type) may function.

**Fire Fighting Procedures:** Keep people away. Isolate fire and deny unnecessary entry. Stay upwind. Keep out of low areas where gases (fumes) can accumulate. Use water spray to cool fire exposed containers and fire affected zone until fire is out and danger of reignition has passed. Fight fire from protected location or safe distance. Consider the use of unmanned hose holders or monitor nozzles. Do not use direct water stream. May spread fire. Eliminate ignition sources. Burning liquids may be moved by flushing with water to protect personnel and minimize property damage. Contain fire water run-off if possible. Fire water run-off, if not contained, may cause environmental damage. Review the "Accidental Release Measures" and the "Ecological Information" sections of this (M)SDS.

**Special Protective Equipment for Firefighters:** Wear positive-pressure self-contained breathing apparatus (SCBA) and protective fire fighting clothing (includes fire fighting helmet, coat, trousers, boots, and gloves). If protective equipment is not available or not used, fight fire from a protected location or safe distance.

**Unusual Fire and Explosion Hazards:** Container may vent and/or rupture due to fire. Violent steam generation or eruption may occur upon application of direct water stream to hot liquids. Electrically ground and bond all equipment. Flammable mixtures of this product are readily ignited even by static discharge. Vapors are heavier than air and may travel a long distance and accumulate in low lying areas. Ignition and/or flash back may occur. Dense smoke is produced when product burns.

**Hazardous Combustion Products:** During a fire, smoke may contain the original material in addition to combustion products of varying composition which may be toxic and/or irritating. Combustion products may include and are not limited to: Carbon monoxide. Carbon dioxide. Combustion products may include trace amounts of: Aromatic hydrocarbons.

## 6. Accidental Release Measures

**Steps to be Taken if Material is Released or Spilled:** Pump with explosion-proof equipment. If available, use foam to smother or suppress. Contain spilled material if possible. Use non-sparking tools in cleanup operations. Absorb with materials such as: Sand. Sawdust. See Section 13, Disposal Considerations, for additional information.

**Personal Precautions:** Isolate area. Vapor explosion hazard. Keep out of sewers. Keep upwind of spill. Ventilate area of leak or spill. Keep unnecessary and unprotected personnel from entering the area. No smoking in area. Eliminate all sources of ignition in vicinity of spill or released vapor to avoid fire or explosion. Ground and bond all containers and handling equipment. See Section 10 for more specific information. Refer to Section 7, Handling, for additional precautionary measures. Use appropriate safety equipment. For additional information, refer to Section 8, Exposure Controls and Personal Protection.

**Environmental Precautions:** Material may float on water and any runoff may create an explosion or fire hazard if ignited. Prevent from entering into soil, ditches, sewers, waterways and/or groundwater. See Section 12, Ecological Information.

## 7. Handling and Storage

### Handling

**General Handling:** Avoid contact with eyes, skin, and clothing. Avoid breathing vapor. Do not swallow. Wash thoroughly after handling. Keep away from heat, sparks and flame. Keep container closed. Use with adequate ventilation. No smoking, open flames or sources of ignition in handling and storage area. Vapors are heavier than air and may travel a long distance and accumulate in low lying areas. Ignition and/or flash back may occur. Electrically ground and bond all equipment. Use of non-sparking or explosion-proof equipment may be necessary, depending upon the type of operation. Containers, even those that have been emptied, can contain vapors. Do not cut, drill, grind, weld, or

perform similar operations on or near empty containers. See Section 8, EXPOSURE CONTROLS AND PERSONAL PROTECTION.

**Storage**

Minimize sources of ignition, such as static build-up, heat, spark or flame. See Section 10 for more specific information.

**To maintain product quality, recommended storage temperature is < -15 °C**

**8. Exposure Controls / Personal Protection**

**Exposure Limits**

Component	List	Type	Value
1,3,5-Trimethylbenzene	ACGIH	TWA	25 ppm

**Personal Protection**

**Eye/Face Protection:** Use chemical goggles. If exposure causes eye discomfort, use a full-face respirator.

**Skin Protection:** Use protective clothing chemically resistant to this material. Selection of specific items such as face shield, boots, apron, or full body suit will depend on the task. Remove contaminated clothing immediately, wash skin area with soap and water, and launder clothing before reuse or dispose of properly. Items which cannot be decontaminated, such as shoes, belts and watchbands, should be removed and disposed of properly.

**Hand protection:** Use gloves chemically resistant to this material. Examples of preferred glove barrier materials include: Polyethylene. Ethyl vinyl alcohol laminate ("EVAL"). Viton. Polyvinyl chloride ("PVC" or "vinyl"). Styrene/butadiene rubber. Polyvinyl alcohol ("PVA"). Examples of acceptable glove barrier materials include: Butyl rubber. Neoprene. Chlorinated polyethylene. Natural rubber ("latex"). Nitrile/butadiene rubber ("nitrile" or "NBR"). NOTICE: The selection of a specific glove for a particular application and duration of use in a workplace should also take into account all relevant workplace factors such as, but not limited to: Other chemicals which may be handled, physical requirements (cut/puncture protection, dexterity, thermal protection), potential body reactions to glove materials, as well as the instructions/specifications provided by the glove supplier.

**Respiratory Protection:** Atmospheric levels should be maintained below the exposure guideline. When respiratory protection is required, use an approved air-purifying or positive-pressure supplied-air respirator depending on the potential airborne concentration. For emergency and other conditions where the exposure guideline may be exceeded, use an approved positive-pressure self-contained breathing apparatus or positive-pressure air line with auxiliary self-contained air supply. In confined or poorly ventilated areas, use an approved self-contained breathing apparatus or positive pressure air line with auxiliary self-contained air supply. The following should be effective types of air-purifying respirators: Organic vapor cartridge.

**Ingestion:** Avoid ingestion of even very small amounts; do not consume or store food or tobacco in the work area; wash hands and face before smoking or eating.

**Engineering Controls**

**Ventilation:** Use only with adequate ventilation. Provide general and/or local exhaust ventilation to control airborne levels below the exposure guidelines.

**9. Physical and Chemical Properties**

<b>Physical State</b>	Liquid
<b>Color</b>	Yellow
<b>Odor</b>	Aromatic
<b>Flash Point - Closed Cup</b>	44 °C (111 °F) <i>Closed Cup (setaflash)</i>
<b>Flammable Limits In Air</b>	<b>Lower:</b> 0.88 %(V) <i>Literature</i> <b>Upper:</b> 6.1 %(V) <i>Literature</i>

<b>Autoignition Temperature</b>	550 °C (1,022 °F) <i>Literature</i>
<b>Vapor Pressure</b>	3.3 hPa @ 25 °C <i>Literature</i>
<b>Boiling Point (760 mmHg)</b>	162 °C (324 °F) <i>Literature</i> .
<b>Vapor Density (air = 1)</b>	4.1 <i>Literature</i>
<b>Specific Gravity (H2O = 1)</b>	0.9521 <i>Literature</i>
<b>Freezing Point</b>	No test data available
<b>Melting Point</b>	Not applicable
<b>Solubility in Water (by weight)</b>	0.1 %
<b>pH</b>	Not applicable
<b>Kinematic Viscosity</b>	350 mm <sup>2</sup> /s @ 25 °C <i>Supplier</i>

## 10. Stability and Reactivity

### Stability/Instability

Stable under recommended storage conditions. See Storage, Section 7. Unstable at elevated temperatures.

**Conditions to Avoid:** Avoid temperatures above 40°C (104°F) Can react with itself at temperatures above 100°C (212°F) Active ingredient decomposes at elevated temperatures. Avoid static discharge. Avoid direct sunlight or ultraviolet sources.

**Inhibitor:** Quinoline, 1,2-dihydro-2,2,4-trimethyl-, polymers

**Incompatible Materials:** Avoid contact with: Strong oxidizers.

### Hazardous Polymerization

Can occur. Can react with itself at temperatures above 100°C (212°F)

### Thermal Decomposition

Decomposition products depend upon temperature, air supply and the presence of other materials.

## 11. Toxicological Information

### Acute Toxicity

#### Ingestion

Single dose oral LD50 has not been determined.

#### Skin Absorption

The dermal LD50 has not been determined.

### Sensitization

#### Skin

A component in this mixture has caused allergic skin reactions in humans.

### Repeated Dose Toxicity

Contains component(s) which have been reported to cause effects on the following organs in animals: Liver. Lung. Central nervous system. Blood.

### Developmental Toxicity

Contains component(s) which caused birth defects in laboratory animals only at doses toxic to the mother. Contains component(s) which, in laboratory animals, have been toxic to the fetus only at doses toxic to the mother.

### Reproductive Toxicity

In animal studies on component(s), effects on reproduction were seen only at doses that produced significant toxicity to the parent animals.

### Genetic Toxicology

For the component(s) tested: In vitro genetic toxicity studies were negative. Animal genetic toxicity studies were negative.

## 12. Ecological Information

### CHEMICAL FATE

Data for Component: **1,3,5-Trimethylbenzene**

#### Movement & Partitioning

Bioconcentration potential is moderate (BCF between 100 and 3000 or Log Pow between 3 and 5). Potential for mobility in soil is low (Koc between 500 and 2000).

**Henry's Law Constant (H):** 1.97E-2 atm\*m3/mole; 25 °C Estimated

**Partition coefficient, n-octanol/water (log Pow):** 3.42 Measured

**Partition coefficient, soil organic carbon/water (Koc):** 700 Estimated

**Bioconcentration Factor (BCF):** 23 - 342; fish; Measured

#### Persistence and Degradability

Material is not readily biodegradable according to OECD/EC guidelines. Biodegradation rate may increase in soil and/or water with acclimation.

#### Indirect Photodegradation with OH Radicals

Rate Constant	Atmospheric Half-life	Method
3.51E-11 cm3/s	3.7 h	Estimated

#### OECD Biodegradation Tests:

Biodegradation	Exposure Time	Method
0 %	28 d	OECD 301C Test

#### Biological oxygen demand (BOD):

BOD 5	BOD 10	BOD 20	BOD 28
3.1 %			

**Theoretical Oxygen Demand:** 3.19 mg/mg

Data for Component: **Quinoline, 1,2-dihydro-2,2,4-trimethyl-, polymers**

#### Persistence and Degradability

Material is not readily biodegradable according to OECD/EC guidelines.

#### OECD Biodegradation Tests:

Biodegradation	Exposure Time	Method
0 %	28 d	OECD 301C Test

Data for Component: **2,6-Bis((4-azidophenyl)methylene)-4-ethylcyclohexanone**

#### Movement & Partitioning

Bioconcentration potential is low (BCF less than 100 or log Pow greater than 7). Expected to be relatively immobile in soil (Koc > 5000).

**Partition coefficient, n-octanol/water (log Pow):** 9.67 Estimated

**Partition coefficient, soil organic carbon/water (Koc):** 20,000 Estimated

### ECOTOXICITY

Data for Component: **1,3,5-Trimethylbenzene**

Material is moderately toxic to aquatic organisms on an acute basis (LC50/EC50 between 1 and 10 mg/L in most sensitive species tested).

#### Fish Acute & Prolonged Toxicity

LC50, Japanese medaka (*Oryzias latipes*): 8.6 mg/l

LC50, goldfish (*Carassius auratus*): 12.5 mg/l

#### Aquatic Invertebrate Acute Toxicity

LC50, water flea *Daphnia magna*: 50 mg/l

#### Aquatic Plant Toxicity

EC50, alga *Scenedesmus* sp., biomass growth inhibition: 25 mg/l

#### Aquatic Invertebrates Chronic Toxicity Value:

ChV Value mg/l	Species	Test Type	Endpoint	Exposure Time
2.8 mg/l	water flea <i>Daphnia magna</i>		number of offspring	21 d

## 13. Disposal Considerations

DO NOT DUMP INTO ANY SEWERS, ON THE GROUND, OR INTO ANY BODY OF WATER. All disposal practices must be in compliance with all Federal, State/Provincial and local laws and regulations. Regulations may vary in different locations. Waste characterizations and compliance with applicable laws are the responsibility solely of the waste generator. DOW HAS NO CONTROL OVER THE MANAGEMENT PRACTICES OR MANUFACTURING PROCESSES OF PARTIES HANDLING OR USING THIS MATERIAL. THE INFORMATION PRESENTED HERE PERTAINS ONLY TO THE PRODUCT AS SHIPPED IN ITS INTENDED CONDITION AS DESCRIBED IN MSDS SECTION: Composition Information. FOR UNUSED & UNCONTAMINATED PRODUCT, the preferred options include sending to a licensed, permitted: Recycler. Reclaimer. Incinerator or other thermal destruction device. As a service to its customers, Dow can provide names of information resources to help identify waste management companies and other facilities which recycle, reprocess or manage chemicals or plastics, and that manage used drums. Telephone Dow's Customer Information Group at 1-800-258-2436 or 1-989-832-1556 (U.S.), or 1-800-331-6451 (Canada) for further details.

## 14. Transport Information

**DOT Non-Bulk**  
NOT REGULATED

**DOT Bulk**  
**Proper Shipping Name:** RESIN SOLUTION  
**Hazard Class:** 3 **ID Number:** UN1866 **Packing Group:** PG III

**IMDG**  
**Proper Shipping Name:** RESIN SOLUTION  
**Hazard Class:** 3 **ID Number:** UN1866 **Packing Group:** PG III  
**EMS Number:** F-E,S-E

**ICAO/IATA**  
**Proper Shipping Name:** RESIN SOLUTION  
**Hazard Class:** 3 **ID Number:** UN1866 **Packing Group:** PG III  
**Cargo Packing Instruction:** 310  
**Passenger Packing Instruction:** 309

*This information is not intended to convey all specific regulatory or operational requirements/information relating to this product. Additional transportation system information can be obtained through an authorized sales or customer service representative. It is the responsibility of the transporting organization to follow all applicable laws, regulations and rules relating to the transportation of the material.*

## 15. Regulatory Information

### OSHA Hazard Communication Standard

This product is a "Hazardous Chemical" as defined by the OSHA Hazard Communication Standard, 29 CFR 1910.1200.

### Superfund Amendments and Reauthorization Act of 1986 Title III (Emergency Planning and Community Right-to-Know Act of 1986) Sections 311 and 312

Immediate (Acute) Health Hazard	Yes
Delayed (Chronic) Health Hazard	Yes
Fire Hazard	Yes

Reactive Hazard No  
Sudden Release of Pressure Hazard No

**Superfund Amendments and Reauthorization Act of 1986 Title III (Emergency Planning and Community Right-to-Know Act of 1986) Section 313**

To the best of our knowledge, this product does not contain chemicals at levels which require reporting under this statute.

**Pennsylvania (Worker and Community Right-To-Know Act): Pennsylvania Hazardous Substances List and/or Pennsylvania Environmental Hazardous Substance List:**

The following product components are cited in the Pennsylvania Hazardous Substance List and/or the Pennsylvania Environmental Substance List, and are present at levels which require reporting.

Component	CAS #	Amount
1,3,5-Trimethylbenzene	108-67-8	>= 50.0 - <= 73.0 %

**Pennsylvania (Worker and Community Right-To-Know Act): Pennsylvania Special Hazardous Substances List:**

To the best of our knowledge, this product does not contain chemicals at levels which require reporting under this statute.

**California Proposition 65 (Safe Drinking Water and Toxic Enforcement Act of 1986)**

This product contains no listed substances known to the State of California to cause cancer, birth defects or other reproductive harm, at levels which would require a warning under the statute.

**US. Toxic Substances Control Act**

All components of this product are on the TSCA Inventory or are exempt from TSCA Inventory requirements under 40 CFR 720.30

**CEPA - Domestic Substances List (DSL)**

This product contains one or more substances which are not listed on the Canadian Domestic Substances List (DSL). Contact your Dow representative for more information.

**16. Other Information**

**Recommended Uses and Restrictions**

Photodefinable polymer dielectric in microelectronic applications.

**Revision**

Identification Number: 50809 / 1001 / Issue Date 04/12/2006 / Version: 2.2

Most recent revision(s) are noted by the bold, double bars in left-hand margin throughout this document.

**Legend**

N/A	Not available
W/W	Weight/Weight
OEL	Occupational Exposure Limit
STEL	Short Term Exposure Limit
TWA	Time Weighted Average
ACGIH	American Conference of Governmental Industrial Hygienists, Inc.
DOW IHG	Dow Industrial Hygiene Guideline
WEEL	Workplace Environmental Exposure Level
HAZ_DES	Hazard Designation

*The Dow Chemical Company urges each customer or recipient of this (M)SDS to study it carefully and consult appropriate expertise, as necessary or appropriate, to become aware of and understand the data contained in this (M)SDS and any hazards associated with the product. The information herein is provided in good faith and believed to be accurate as of the effective date shown above. However, no*



*warranty, express or implied, is given. Regulatory requirements are subject to change and may differ between various locations. It is the buyer's/user's responsibility to ensure that his activities comply with all federal, state, provincial or local laws. The information presented here pertains only to the product as shipped. Since conditions for use of the product are not under the control of the manufacturer, it is the buyer's/user's duty to determine the conditions necessary for the safe use of this product. Due to the proliferation of sources for information such as manufacturer-specific (M)SDSs, we are not and cannot be responsible for (M)SDSs obtained from any source other than ourselves. If you have obtained an (M)SDS from another source or if you are not sure that the (M)SDS you have is current, please contact us for the most current version.*