

PRODUCT NAME: JSR NFR016D2

SAFETY DATA SHEET

1. CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

Product Identifier: **JSR NFR 016D2**
General Use: Photoresist for Integrated Circuit Production
Product Description: Photosensitizer and Phenolic Resin Solution

MANUFACTURER:
JSR Corporation
1-9-2, Higashi-Shinbashi,
Minato-ku, Tokyo
105-8640 Japan

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DISTRIBUTOR
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2. HAZARDS IDENTIFICATION

GHS Classification




| Hazard Group | Hazard class | Category | |
|---|--|------------------------------|----------------|
| Physical Hazards | Explosives | Not classified | |
| | Flammable gases | Not classified | |
| | Flammable aerosols | Not classified | |
| | Oxidizing gasses | Not classified | |
| | Gases under pressure | Not classified | |
| | Flammable liquids | Category 3 | |
| | Flammable solids | Not classified | |
| | Self-reactive substances and mixtures | Not classified | |
| | Pyrophoric liquids | Not classified | |
| | Pyrophoric solids | Not classified | |
| | Self-heating substances and mixtures | Not classified | |
| | Substances and mixtures which, in contact with water, emit flammable gases | Not classified | |
| | Oxidizing liquids | Not classified | |
| | Oxidizing solids | Not classified | |
| | Organic peroxides | Not classified | |
| | Corrosive to metals | Not classified | |
| Health Hazards | Acute toxicity | Oral | Not Classified |
| | | Dermal | Not Classified |
| | | Inhalation (Gasses) | Not Classified |
| | | Inhalation (Vapors) | Category 3 |
| | | Inhalation (Dusts and Mists) | Not Classified |
| | Skin corrosion/irritation | Category 2 | |
| | Serious eye damage/eye irritation | Category 2 | |
| | Respiratory or skin sensitization | Not Classified | |
| | Germ cell mutagenicity | Not Classified | |
| | Carcinogenicity | Not Classified | |
| Reproductive toxicity | Category 2 | | |
| Specific target organ systemic toxicity-Single exposure | Category 3 | | |

PRODUCT NAME: JSR NFR016D2

| | | |
|--------------------------------------|---|----------------------------------|
| | Target Organs | May cause respiratory irritation |
| | Specific target organ systemic toxicity-Repeated exposure | Not Classified |
| | Target Organs | NA |
| | Aspiration hazard | Not Classified |
| Hazardous to the aquatic environment | Acute aquatic toxicity | Not Classified |
| | Chronic aquatic toxicity | Not Classified |

GHS label elements

Hazard symbols:

| Flame | Skull and Crossbones | Health Hazard | | |
|---|---|---|--|--|
|  |  |  | | |

Signal word: **Danger**

Hazard statement:

- Flammable liquid and vapor.
- Toxic if inhaled.
- Causes skin irritation.
- Causes serious eye irritation.
- Suspected of damaging fertility or the unborn child.
- May cause respiratory irritation.

Precautionary Statements:

Prevention:

- Keep away from heat, sparks, open flames and hot surfaces. – No smoking.
- Keep container tightly closed.
- Ground/Bond container and receiving equipment.
- Use explosion proof electrical, ventilation, lighting and equipment.
- Use only non-sparking tools.
- Take precautionary measure against static discharge.
- Wear protective gloves, protective clothing, eye protection and face protection.
- Avoid breathing dust, fumes, gas, mist, vapors or spray.
- Use only outdoors or in a well-ventilated area.
- Wash hands thoroughly after handling.
- Obtain special instructions before use.
- Do not handle until all safety precautions have been read and understood.

Response:

- In on skin (or hair): Take off immediately all contaminated clothing and wash before reuse. Rinse skin with water/shower.
- In case of fire: Use carbon dioxide, alcohol foam or dry chemical to extinguish.
- If inhaled: Remove person to fresh air and keep comfortable for breathing.
- Call a poison center, doctor or seek medical attention.
- Specific treatment (see Section 4 on this SDS).
- If in eyes: Rinse cautiously with water for several minutes. Remove contact lenses,

PRODUCT NAME: **JSR NFR016D2**

- if present and easy to do. Continue rinsing.
- If skin irritation occurs or eye irritation persists: Get medical advice/attention.
- If exposed or concerned: Get medical advice/attention.

Storage:

- Store in a well-ventilated place. Keep cool.
- Keep container tightly closed.
- Store locked up.

Disposal:

- Dispose of contents/containers in accordance with local and federal regulations.

NFPA RATING (Scale 0 – 4): HEALTH = 1; FIRE = 2; REACTIVITY = 0

3. COMPOSITION / INFORMATION ON INGREDIENTS

| | % | CAS No. |
|------------------------------------|--------|-------------|
| Cresol-formaldehyde(Novolac) Resin | 15-30 | Proprietary |
| Trisphenol derivative | 1-10 | Proprietary |
| Melamine compound | 1-10 | Proprietary |
| Photosensitizer | 0.1- 5 | Proprietary |
| Methyl 3-methoxypropionate(MMP) | 50-80 | 3852- 09- 3 |

4. FIRST AID MEASURES

INHALATION:

May cause irritation to nose, throat and anesthesia. Remove exposed person to fresh air; perform artificial respiration if necessary. Call a physician.

EYE CONTACT:

Eye contact may cause severe irritation. Immediately flush eyes with plenty of water at least 15 min. Call a physician.

SKIN CONTACT:

Prolonged and repeated contact with skin may cause irritation and dermatitis. Flush skin with water and soap.

INGESTION:

Swallowing may nauseate and cause pain in esophagus and stomach. Give large quantities of water, contact a poison center and call physician immediately.

NOTE TO PHYSICIAN:

Treatment may vary with condition of victim and specifics of incident.

5. FIRE-FIGHTING MEASURES

GENERAL HAZARD:

Combustible liquid. May release vapors that form flammable mixtures when temperatures are at or above the flash point. Toxic gases will form upon combustion.

EXTINGUISHING MEDIA:

Carbon dioxide, alcohol foam or dry chemical.

SPECIAL FIRE FIGHTING PROCEDURES:

Water should be used to keep fire exposed containers cool and to dispense vapors. Firefighters should wear self-contained breathing apparatus.

FIRE AND EXPLOSION HAZARDS:

Combustible liquid. Toxic gases, smoke, and oxides of Carbon will form upon combustion.

6. ACCIDENTAL RELEASE MEASURES

LARGE SPILL/SMALL SPILL:

PRODUCT NAME: JSR NFR016D2

For indoor spills, provide increased ventilation as required to minimize exposure. Contain, absorb, and cleanup the spill as indicated in the appropriate land or water section below. Dispose of absorbent and other waste in an appropriate chemical waste container. Wear proper personal protective equipment. Wash thoroughly after handling.

LAND SPILL:

Dike or absorb with inert absorbent material and transfer to D.O.T. container for disposal.

WATER SPILL:

Remove from surface by skimming or with suitable absorbent.

7. HANDLING AND STORAGE**GENERAL:**

Store in original container in a dry area. Avoid heat, sunlight, and ignition sources. Open only under safe light and well ventilated conditions. Loosen closure cautiously before opening. When using this substance: (a) avoid breathing the substance; (b) avoid ingestion; (c) use respiratory protection when in dust or mist form. Wear chemical goggles, resistant gloves and protective clothing to prevent contact. Wash thoroughly after handling.

Recommended storage temperature: Maintain the storage temperature below 35°C (95°F). This storage temperature is intended for health and safety purposes only and is valid within the shelf life + 3 month period. For technical applications, see the product specifications and label.

STORAGE PRESSURE:

Atmospheric

INCOMPATIBILITIES:

Strong oxidizing agents, strong acids, strong bases

8. EXPOSURE CONTROLS/PERSONAL PROTECTION**ENGINEERING CONTROLS:**

The use of local exhaust ventilation is recommended to control emissions near the source. Laboratory samples should be handled in a fumehood. Provide mechanical ventilation of confined spaces. Use explosion-proof ventilation equipment.

PERSONAL PROTECTION**RESPIRATORY PROTECTION:**

Under conditions of frequent use or heavy exposure, Respiratory protection may be needed. Respiratory protection is ranked in order from minimum to maximum. Consider warning properties before use. NIOSH approved respirators as follows:
Any chemical cartridge respirator with organic vapor cartridge(s).
Any chemical cartridge respirator with a full facepiece and organic vapor cartridge(s).
Any air-purifying respirator with a full facepiece and an organic vapor canister.
For Unknown Concentrations or Immediately Dangerous to Life or Health.
Any supplied-air respirator with full facepiece and operated in a pressure-demand or other positive-pressure mode in combination with a separate escape supply.
Any self-contained breathing apparatus with a full facepiece.

SKIN PROTECTION:

Wear impermeable gloves and clothing during activities where there is potential for direct skin contact with chemical.

EYE PROTECTION:

Wear primary eye protection such as splash resistant safety goggles with a secondary protection faceshield. Provide an emergency eye wash station and quick drench shower in the immediate work area.

EXPOSURE GUIDELINE (S):

OSHA HAZARDS (29 CFR 1910.1200) Exposure Limits 8 hrs. TWA (ppm)

PRODUCT NAME: JSR NFR016D2

| | | |
|-----------------------|-----------------|-----------------|
| (29 CFR 1910.1200) | OSHA PEL | ACGIH TLV |
| Novolac Resin | Not-established | Not-established |
| Trisphenol derivative | Not-established | Not-established |
| Melamine compound | Not-established | Not-established |
| Photosensitizer | Not-established | Not-established |
| MMP | Not-established | Not-established |

9. PHYSICAL AND CHEMICAL PROPERTIES

| Properties | Value |
|------------------------|-------------------------------------|
| Appearance: | Clear, pale yellow viscous liquid |
| Odor: | Sweet ester-like odor |
| Odor threshold: | No applicable information available |
| Vapor Pressure: | 2.4 hPa at |
| | 20 °C |
| Relative Density: | 0.9 – 1.1 |
| Solubility: | Moderate in water |
| Boiling Point: | 143 °C |
| | 289.4 °F |
| Flashpoint and Method: | 47.0 °C (est) |
| | 116.6 °F (est) |
| Flammable Limits: | 1.9 % LEL |
| | 13.1 % UFL |

| Properties | Value |
|----------------------------|-------------------------------------|
| Autoignition Temperature: | 389 °C |
| | 732.2 °F |
| pH: | No applicable information available |
| Melting/Freezing Point: | NA °C |
| | NA °F |
| Evaporation rate: | No applicable information available |
| Flammability: | Category 3 |
| Vapor Density: | No applicable information available |
| Decomposition Temperature: | NA °C |
| | NA °F |
| Partition coefficient: | No applicable information available |
| Viscosity: | No applicable information available |

10. STABILITY AND REACTIVITY

POSSIBILITY OF HAZARDOUS REACTIONS:

May react with strong oxidizing agents, strong acids, strong bases.

CHEMICAL STABILITY:

Materials containing similar structural groups are normally stable. This material maybe sensitive to peroxide formation.

CONDITIONS TO AVOID:

Avoid heat, sunlight and ignition sources.

INCOMPATIBLE MATERIALS: (Specific Materials to Avoid)

Strong oxidizing agents, strong acids, strong bases.

HAZARDOUS DECOMPOSITION PRODUCTS:

Combustion will produce toxic vapors and gases.

11. TOXICOLOGICAL INFORMATION

SOLVENT (MMP)

ACUTE TOXICITY

Oral LD50 rat 3,700 mg/kg

PRODUCT NAME: JSR NFR016D2

| | | | |
|-------------------------------------|------|-----|--------------|
| Inhalation (Vapor) | LC50 | rat | >1,200 ppm |
| MUTAGENICITY | | | |
| AMES Test: | | | Negative |
| Chromosomal aberration: | | | Negative |
| Trisphenol derivative: | | | |
| ACUTE TOXICITY | | | |
| Oral | LD50 | rat | >5,000mg/kg |
| Mutagenicity | | | |
| Ames Test: | | | Negative |
| Melamine compound: | | | |
| ACUTE TOXICITY | | | |
| Oral | LD50 | rat | 1,800 mg/kg |
| Photosensitizer: | | | |
| ACUTE TOXICITY | | | |
| Oral | LD50 | rat | >2,000 mg/kg |
| Cresol-formaldehyde(Novolac) Resin: | | | |
| CARCINOGENICITY: | | | |
| Not known to be carcinogenic. | | | |
| NTP: No | | | |
| IARC MONOGRAPHS: No | | | |
| OSHA Regulated: No | | | |

For potential routes of exposure, symptoms related to the toxicological characteristics, delayed and immediate effects and chronic effects from short and long-term exposure see Section 4 on this SDS.

12. ECOLOGICAL INFORMATION

| | |
|--------------------------------------|---|
| SOLVENT (MMP) | FISH TOXICITY: 203.6 mg/L 96hr LC50 (Fish species) CRUSTACEAN TOXICITY: 519 mg/L 48hr EC50 (Daphnia magna) ALGAL TOXICITY: 298 mg/L 72 or 96hr EC50 (Algae) |
| Trisphenol derivative: | No information available |
| Melamine compound: | No information available |
| Photosensitizer: | No information available |
| Cresol-formaldehyde(Novolac) Resin: | No information available |

13. DISPOSAL CONSIDERATION

The user of this product must properly characterize the waste generated from the use of this product in accordance with all applicable federal, state and/or local laws and regulations in order to determine the proper disposal of the waste in accordance with all applicable federal, state and/or local laws and regulations.

14. TRANSPORT INFORMATION

TRANSPORTATION AND HAZARDOUS MATERIALS DESCRIPTION:

Package and transport in accordance with Department of Transportation (DOT) and other regulatory agency requirements.

| | |
|---------------------------------|--------------------------------------|
| U. S. DOT PROPER SHIPPING NAME: | UN1866, Resin solution, Class 3, III |
| IATA PROPER SHIPPING NAME: | Resin solution |
| IDENTIFICATION NUMBER: | UN 1866 |

15. REGULATORY INFORMATION

PRODUCT NAME: **JSR NFR016D2**

OSHA HAZARD COMMUNICATION STANDARD, 29 CFR 1910.1200: Ensure that the hazards associated with this product are transmitted to employees by means of a hazard communications program, in accordance with federal and state Occupational Safety and Health Administration (OSHA) regulations.

CERCLA/SUPERFUND HAZARD CATEGORY: At the time of this document's preparation, none of the ingredients of this product were listed in 40 CFR 302.4. The list should be periodically checked for applicable updates.

SARA 313 INFORMATION: At the time of this document's preparation, none of the ingredients of this product were listed in 40 CFR 372. The list should be periodically checked for applicable updates.

TOXIC SUBSTANCES CONTROL ACT (TSCA): All of the compounds in this product are on the TSCA Inventory and/or are subject to a Low Volume Exemption. The Trisphenol derivative is subject to the significant new use rule (40 CFR 721.5867). In accordance with federal regulations, this Photoresist shall be used only to industrially manufacture integrated circuits. In particular, this material shall not be distributed to any person, other than for disposal, until after it has been completely reacted on integrated circuits or similar media. All users must utilize the worker protection measures and environmental release controls specified in this Safety Data Sheet.

The significant new use rule codified in 40 CFR 721.5867 should be reviewed to ensure the use, hazard communication programs, workplace practices, pollution prevention and record-keeping meet federal requirements. Use of this product without complying with the requirements and implementing the programs specified in 40 CFR 721.5867 shall be considered a significant new use.

Acknowledgment of receipt of this Safety Data Sheet shall be considered acknowledgment that the user will comply with these requirements.

CALIFORNIA PROPOSITION 65 WARNING: At the time of this document's preparation, one or more constituents of this product were included on the Proposition 65 list of chemicals known to cause cancer and birth defects or other reproductive harm. The list should be periodically checked for applicable updates.

16. DATE PREPARED

REVISION SUMMARY

| | |
|-------------------|----------------------------------|
| June 6, 1994 | Original SDS established. |
| December 15, 1997 | Revision 1 established. |
| August 6, 1998 | Revision 2 established. |
| April 9, 1999 | Revision 3 established. |
| March 2, 2000 | Revision 4 established. |
| June 12, 2001 | Revision 5 established. |
| January 27, 2005 | Revision 6 established. |
| February 21, 2005 | Revision 7 established. |
| March 25, 2005 | Revision 8 established. |
| December 9, 2005 | Revision 9 established. |
| November 17, 2008 | Revision 10 established. |
| March 30, 2009 | Revision 11 established. |
| September 9, 2013 | Revision 12 GHS SDS established. |

PRODUCT NAME: **JSR NFR016D2**

To the best of our knowledge, the information contained herein is accurate. However, neither JSR Corporation nor any of its subsidiaries assumes any liability whatsoever for the accuracy or completeness of the information contained herein. Final determination of suitability of any material is the sole responsibility of the user. All materials may present unknown hazards and should be used with caution. Although certain hazards are described herein, we cannot guarantee that these are the only hazards, which exist.