

Industrial Summit Technology Corporation  
Material Safety Data Sheet

SKYBOND® 700 POLYIMIDE RESIN

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**1. PRODUCT IDENTIFICATION**

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Synonym:	Solution of aromatic polyimide precursor in ethanol and n-methyl pyrrolidone (NMP)
Chemical Name:	1,2-Benzenedicarboxylic acid, 4,4'carbonylbis-,ar,ar'-diethyl ester, compd. With 1,3-benzenediamine
CAS No.:	65701-07-7
Contains:	Methanol, CAS No. 67-56-1, ~0.2%, Methyl isobutyl ketone, CAS No. 108-10-1, ~0.1%
TSCA Inventory:	All components of this product appear on the Inventory of Chemical Substances published by the U.S. Environmental Protection Agency (EPA) under the authority of the Toxic Substances Control Act (TSCA).
DOT Proper Shipping Name:	Resin Solution
DOT Hazard Class/I.D. No./Packaging Group:	3 Flammable Liquid / UN 1866 / PGIII
DOT Label:	Flammable Liquid
U.S. Surface Freight Classification:	Plastics, synthetic, N.O.I. liquid
Reportable Quantity (RQ) Under Dot (49 CFR) and CERCLA Regulations:	Not Applicable
SARA Hazard Notification Hazard Categories under criteria of SARA Title III rules (40 CFR Part 370):	Immediate, Delayed, Fire.
Section 313 Toxic Chemical(s):	This product contains the following substances which are defined as toxic chemicals under and subject to the reporting requirements of Section 313 of Title III of the Superfund Amendments and Reauthorization
Act of 1986 and 40 CFR Part 372:	<ul style="list-style-type: none"><li>• N-Methylpyrrolidinone (n-methylpyrrolidone, NMP), CAS No. 872-50-4</li><li>• 1,3-Diaminobenzene (m-phenylenediamine), CAS No. 108-45-2</li></ul>
Hazardous Chemical(s) Under OSHA Hazard Communication Standard:	
In addition to the SARA 313 chemicals listed above, this product contains the following substances which is identified as a hazardous chemical under the criteria of the OSHA Hazard Communication Standard (29 CFR 1910.1200):	<ul style="list-style-type: none"><li>• Ethyl alcohol (ethanol), CAS No. 64-17-5</li></ul>

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**2. WARNING STATEMENTS**

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DANGER!  
COMBUSTIBLE LIQUID AND VAPOR  
CAUSES EYE BURNS  
HARMFUL IF INHALED  
CAUSES SKIN AND RESPIRATORY TRACT IRRITATION  
MAY CAUSE ALLERGIC SKIN REACTION

CONTAINS m-PHENYLENDIAMINE WHICH MAY CAUSE LIVER DAMAGE BASED ON ANIMAL DATA

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### 3. PRECAUTIONARY MEASURES

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Keep away from heat and flame.  
Use with adequate ventilation.  
Do not get in eyes, on skin or on clothing.  
Avoid breathing vapors.  
Keep container closed.  
Wash thoroughly after handling.

#### CONTAINER HAZARDOUS WHEN EMPTY:

Emptied containers resin vapor and product residue. FOLLOW LABELED WARNINGS EVEN AFTER CONTAINER IS EMPTIED. RESIDUAL VAPORS MAY EXPLODE ON IGNITION. DO NO CUT, DRILL, GRIND OR WELD ON OR NEAR THIS CONTAINER. Improper disposal or reuse of this container may be dangerous and/or illegal.

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### 4. EMERGENCY AND FIRST AID PROCEDURES

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#### FIRST AID:

IF IN EYES, immediately flush with plenty of water for at least 15 minutes. Get medical attention. Remove material from skin and clothing.

IF INHALED, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical attention. Contact a poison control center. Remove material from eyes, skin and clothing.

IF ON SKIN, flush the area with plenty of water. Remove contaminated clothing. Wash clothing before reuse. Get medical attention.

#### IN CASE OF:

FIRE, use water spray, dry chemical, foam or carbon dioxide.

SPILL OR LEAK, flush area with water spray. (see "Spill, Leak & Disposal Information" section).

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### 5. OCCUPATIONAL CONTROL PROCEDURES

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Eye Protection: Where there is significant potential for eye contact, wear chemical goggles and have eye baths immediately available.

Skin Protection: Wear appropriate chemical resistant gloves to prevent skin contact. Consult glove manufacturer to determine type of glove for given application. Wear chemical safety glasses, a face shield and a chemical apron when splashing is likely. Wash immediately if skin is contaminated. Remove contaminated clothing promptly and launder before reuse. Clean protective equipment before reuse. Provide a safety shower at any location where skin contact can occur. Wash thoroughly after handling.

Attention! Repeated or prolonged contact may cause allergic skin reaction in some people.

Respiratory Protection: Avoid breathing vapor and/or mist. Use NIOSH/MSHA approved respiratory protection equipment (full facepiece recommended) when airborne exposure limits (see below) are exceeded. If used, full facepiece replaces need for face shield and Chemical goggles. Consult respirator manufacturer to determine appropriate type equipment for given application. Observe respirator use limitations specified by NIOSH/MSHA or the manufacturer. Respiratory protection programs must comply with

29 CFR 1910.134.

Ventilation: Provide natural or mechanical ventilation to control exposure levels below airborne exposure limits (see below). If practical, use local mechanical exhaust ventilation at sources of air contamination such as open process equipment. Consult NFPA Standard 91 for design of exhaust system.

Airborne Exposure Limits: Product:SKYBOND® 700 polyimide resin  
OSHA PEL: None established  
ACGIH TLV: None established  
Component:m-Phenylenediamine wt. % ~13  
OSHA PEL: None established ACGIH TLV: None established  
Component:n-Methylpyrrolidone wt. % ~34  
OSHA PEL: None established  
ACGIH TLV: None established

IST Corp. has adopted, for its own internal use, an exposure limit 2ppm (8 mg/m<sup>3</sup>), 8-hour time-weighted average (Skin)\* for n-methylpyrrolidone.

Component: Ethanol wt. % ~5  
OSHA PEL: 1000ppm 8-hour time-weighted average  
ACGIH TLV: 1000ppm 8-hour time-weighted average

\*Skin notation means that skin absorption of this material may add to the overall exposure. Avoid skin contact.

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## 6. FIRE PROTECTION INFORMATION

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Flash Point: 120°F

Method: Setaflash, Closed Cup

Extinguishing Media: Water spray, dry chemical, foam, carbon dioxide or any Class B extinguishing agent.

Special Firefighting Procedures: Firefighters and others who may be exposed to products of combustion (see "Hazardous Decomposition Products", below) should wear full protective clothing and self-contained breathing apparatus. Thoroughly decontaminate equipment after use.

Unusual Fire and Explosion Hazards: Closed containers exposed to heat may build up pressure. Use water spray to keep exposed containers and equipment cool.

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## 7. REACTIVITY DATA

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Materials To Avoid: Strong oxidizing and reducing agents.

Conditions To Avoid: Do not expose to heat or ignition sources. Volatiles given off during cure – ethanol, n-methylpyrrolidone.

Hazardous Decomposition Products: Carbon monoxide, nitrogenous products.

Hazardous Polymerization: Does not occur.

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## 8. HEALTH EFFECTS SUMMARY

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The following information summarizes human experience and the results of scientific investigations reviewed by health professionals for hazard evaluation of Skybond® 700 polyimide resin solution and development of Precautionary Measures and Occupational Control Procedures recommended in this document.

### Effects of Exposure

Inhalation and skin contact are expected to be the primary routes of occupational exposure to SKYBOND® 700 polyimide resin. Occupational exposure to this material has not been reported to cause significant adverse human health effects. However, this material is considered to cause eye burns based on animal studies. The organic solvents described below have been reported to cause eye, skin and respiratory tract irritation and may contribute to the irritancy of this material. These solvents also possess narcotic-like properties; excessive exposure may result in headache, dizziness, incoordination, nausea, loss of appetite and loss of consciousness.

Meta-phenylenediamine (m-PDA) may be present in free or partially reacted form (salts) in this SKYBOND resin. It has been reported to cause eye, skin and respiratory tract irritation and may contribute to the irritancy of this material. It is considered to be moderately toxic orally and by inhalation. m-PDA is absorbed through the skin and may cause staining of the skin if contact occurs. Although infrequent in humans, allergic skin reaction has been reported following contact with m-PDA. This component may cause liver damage based on animal data. Limited reports in the scientific literature suggest possible liver changes occurring in humans occupationally exposed to low levels of m-PDA.

#### Toxicological Data

Data from I.S.T Corp. studies indicate are given below.

Single-dose (acute) animal studies indicate:

Oral:

Slightly Toxic (Rat LD50 – 3945 mg/kg)

Dermal:

Practically Nontoxic (Rabbit LD50 -> 5,000mg/kg)

Eye Irritation:

Corrosive (Rabbit)

Skin Irritation:

Practically Nonirritating (Rabbit, 4-hr. exp.)

Skin Irritation:

Practically Nonirritating (Rabbit, 24-hr. exp.)

No allergic skin reaction was observed in guinea pigs following repeated skin exposure to SKYBOND 700 polyimide resin. No birth defects were observed in rats given this material orally during pregnancy, even at levels which produced toxic effects in the mothers and offspring. Genetic changes were reported in standard tests with bacterial cells; however, no adverse genetic changes were observed in standard tests with animals and animal cells.

#### Components

Data from the available scientific literature on the components of SKYBOND 700 polyimide resin which have been identified as hazardous chemicals under the criteria of the OSHA Hazard Communication Standard (29 CFR 1910.1200) are discussed below:

##### Meta-phenylenediamine (m-PDA)

Meta-phenylenediamine (m-PDA) is used in the production of this polyimide resin. Single-dose (acute) animal studies indicate that m-PDA is moderately toxic orally (rats) and by inhalation (rats) and slightly toxic after skin application (rabbits). It is moderately irritating to rabbit eyes and skin. Allergic skin reactions have been reported in various laboratory animals in repeated skin application tests. Rats given this material orally for 90 days showed increased liver and kidney weights and liver damage.

No significant increase in tumors was reported in drinking water study (mice, 78 weeks), skin painting study (mice, 24 months) or a long-term feeding study (rats, mice). No birth defects were reported in rats given this material orally during pregnancy, even at levels which produced toxic effects in the mothers. Adverse genetic effects have been reported in standard tests using bacterial and animal cells. Both positive and negative genetic changes were reported in standard tests using animals. No adverse genetic changes were reported in standard tests with human cell cultures and insects.

##### n-Methylpyrrolidone (NMP)

Human experience indicates that continued or gross skin contact with NMP produces irritation, redness and defatting of the skin. Inhalation of very high concentrations of NMP may result in headache, giddiness, nausea and mental confusion. Repeated dosing of laboratory animals with NMP has been reported to cause

changes in organ weights and blood composition, reduced response to sound, and breathing difficulty at a dosage which produced death. No skin allergy was observed in guinea pigs following repeated skin exposure. Long-term inhalation (2 years) of NMP produced no increase in tumors in rats and NMP did not show tumor initiating activity in a mouse skin painting study. Birth defects were reported following dermal application of NMP to rats at amounts which produced adverse effects on the mother and following intraperitoneal injection in two strains of mice. No birth defects were reported in rats exposed to NMP by inhalation. No effects were seen on the ability of rats to reproduce when exposed to NMP for two successive generations, although toxic effects were reported in offspring at levels which produced adverse effects on the mother. NMP has produced no genetic changes in standard tests using animal and bacterial cells.

### Ethanol

In addition to the irritating effects noted above, swallowing of ethanol also causes nervous system effects and gastrointestinal tract effects; substantial amounts may cause respiratory failure leading to death. Other effects of ethanol related to repeated intake of alcoholic beverages include nutritional deficiencies, pancreas and liver damage and blood cell changes. Repeated consumption of ethanol (alcoholic beverages) by pregnant women is reported to produce adverse effects on the development of their offspring ("fetal alcohol syndrome")

Single-dose studies indicate that ethanol is practically nontoxic orally (rats) and after skin application (rabbits) or after inhalation (rats). It is mildly to severely irritating to rabbit eyes and practically nonirritating to moderately irritating to rabbit skin. It is practically nontoxic by inhalation (rat, LC50 - 20,000 ppm, 10 hour exposure). Various morphological functions and biochemical changes in heart muscle, liver, CNS and blood cells have been reported for experimental animals given ethanol orally. Repeated inhalation exposures produced liver damage in rabbits, while other treatment-related effects were reported in pigs, dogs and monkeys. Rats exposed by skin application to a 50% solution of ethanol showed only temporary skin irritation.

Several species of laboratory animals have been exposed to ethanol by various routes to determine effects on offspring. While susceptibility varies with each species, birth defects have been consistently reported in many of the species tested (mouse, rat, pig, guinea pig, monkey). Ethanol produced genetic changes in standard tests using human volunteers and animals and yeast cells. No genetic changes were reported in standard tests using bacterial or animal cells, and negative responses were reported in assays using human cells.

Ethanol is listed as a substance which is "carcinogenic to humans" by the International Agency for Research on Cancer ([IARC Monographs](#) Vol. 44). This IRAC listing is based on their determination that although inadequate evidence exists for the carcinogenicity of ethanol and alcohol beverages in animals, sufficient evidence exists for the carcinogenicity of alcoholic beverages following long-term consumption of alcoholic beverages. Epidemiological studies report increased incidence of mouth and throat cancer in humans after long-term consumption of alcoholic beverages. Higher risk is associated with the drinking of dark liquors and for smokers who consume alcoholic beverages.

### Additional Information

A Threshold Limit Value (TLV) has been established by the American Conference of Governmental Industrial Hygienists (ACGIH) for ethanol, one of the organic solvents used in SKYBOND 700 polyimide resin. For further information on this material, please refer to the current edition of the [Documentation of Threshold Limit Values and Biological Exposure Indices](#).

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## **9. PHYSICAL DATA**

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Appearance:	Brown viscous liquid
Odor:	Amine-like
Solubility in Water:	Slight
Specific Gravity(H <sub>2</sub> O = 1):	1.15 – 1.18
Vapor Density:	3.23
Brookfield Viscosity:	2,500 - 7,000 cps at 25°C
Vapor Pressure (mm Hg):	9

Solid after Cure (1.0±0.1g, 288°C at 1hr): 44.5 – 47.5%

**Note:**

These physical data are typical values based on material tested but may vary from sample to sample. Typical values should not be construed as a guaranteed analysis of any specific lot or as specifications for the product.

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## **10. SPILL, LEAK & DISPOSAL INFORMATION**

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**Waste Disposal:**

SKYBOND® 700 polyimide resin is a "hazardous waste" as that term is defined in the Resource Conservation and Recovery Act (RCRA), 40 CFR 261, "Identification and Listing of Hazardous Waste", due to its characteristics of ignitability. Disposal via incineration is required by regulation, Disposal should be in accordance with all applicable local, state and federal laws and regulations. Consult your attorney or appropriate regulatory officials for information on such disposal.

**Spill or Leakage Procedures:**

Remove any source of sparks, flame or hot surfaces. Insure adequate ventilation. Absorb spill with commercial absorbing materials and dispose of as recommended above. Flush area with water. Keep out of sewers, water sheds and water system.

For further information refer to DOT Emergency Response Guidebook, Guide #26.

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## **11. ENVIRONMENTAL EFFECTS**

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**Environmental Toxicity Information:**

96-hr LC50 Bluegill Sunfish:	380 mg/l, Practically Nontoxic
96-hr LC50 Rainbow Trout:	340 mg/l, Practically Nontoxic
48-hr LC50 Daphnia magna:	16 mg/l, Slightly Toxic

Date: 10/15/96

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**End of MSDS**