

ULTRADEL™

MICROELECTRONIC
COATINGS

BY AMOCO CHEMICAL

Ultradel 7505

ULTRADEL 7505 COATING

Bulletin UL-P9

Ultradel® 7505 Coatings are negative-acting, photo-sensitive polyimides used in passivation and multichip module (MCM) applications. Characterized by high thermal stability, high resolution, and high photospeed, these coatings provide smooth wall profiles and exhibit very low shrinkage.

Coating thicknesses ranging from 5 to 30-microns after final cure can be formed in a single spin coat operation. Alternative solution viscosities are available for applications requiring different thicknesses. Final cure temperatures between 200°C and 350°C can be used.

Adhesion promoter

Combine Ultradel A200 Adhesion Promoter Concentrate with Ultradel B200 Diluent (1:2,000 by weight). Let the mixture stand for at least 12 hours before using. After mixing, the Ultradel A/B 200 Adhesion Promoter has a 20-day shelf life.

Substrate preparation

Use a standard pre-deposition cleaning procedure followed by a dehydration bake. Dispense 5 ml of Ultradel A/B 200 onto a 6-inch substrate. Spread at 500 RPM for 5 seconds followed by 4000 RPM for 30 seconds. Bake on a hotplate at 100°C for 30 seconds. No adhesion promoter is needed for subsequent coats.

Spin coating

For a 6-inch substrate, apply 5 ml of solution. Spread for 30 seconds at 500 RPM, then spin for 60 seconds at the final speed as determined for a given thickness using Figure 1.

Softbake

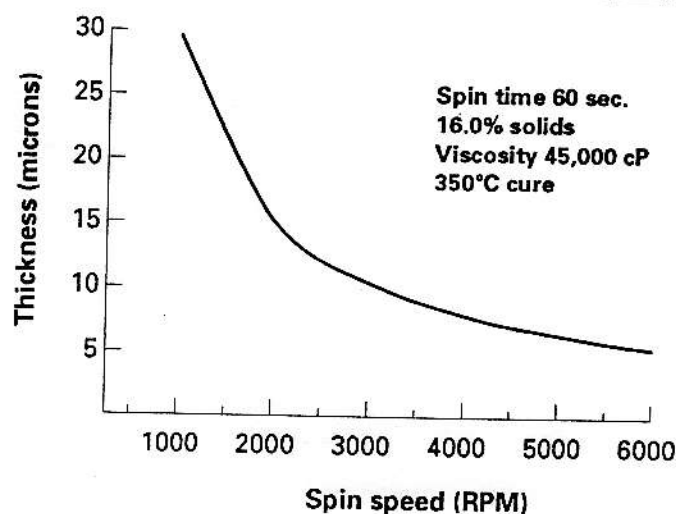
For a 15-micron coating, bake for 10 minutes on a 100°C hotplate or in a nitrogen-purged oven at 100°C for 20 minutes. Adjust bake time for other thicknesses.

Imaging

Ultradel 7505 Coatings absorb in the g- and i-line bands. Coatings may require 600-1200 mJ/cm² (measured at

Figure 1

Coating thickness vs. spin speed for Ultradel 7505



365 nm), depending on the coating thickness and the nature of the underlying substrate. Reflective substrates require less exposure. Overexposure can decrease resolution and increase residue. Underexposure can affect adhesion and result in curved lines and inverted sidewall profiles.

Post-Exposure Bake

Bake 3 minutes on a 100°C hotplate, or 10 minutes in a 100°C oven.

Development

Immersion or spray development can be used. Ultrasonic agitation accelerates immersion development. Use Ultradel D760D developer at room temperature. Immersion development typically requires 45-90 seconds depending on coating thickness. Spray development requires 3-4 minutes.

After development, rinse with Ultradel R760D for 30 seconds, then dry the substrate.



7505
Coating

Cure

A final cure is required to optimize coating properties. Cure in a nitrogen-purged oven using the schedule outlined in Table 1. Each row describes the recommended cure schedule for different maximum temperatures.

Table 1

Cure schedule for Ultradel 7505

Max. Cure Temp., °C	Time at each temperature, hrs.					
	80	160	200	250	300	350
200	1	2	5-6	-	-	-
250	1	1	2	2	-	-
300	1	1	2	-	1	-
350	1	1	2	-	-	0.5

Table 2

Solution properties of Ultradel 7505 Coating

Solvent system	<i>gamma</i> -Butyrolactone
Solids, %	16.0 ± 1
Viscosity, cP	42,000-48,000
Density, g/cc	1.1

Table 3

Cured properties of Ultradel 7505 Coating*

Electrical properties

Dielectric constant, 1 MHz	2.8
Dissipation factor, 1MHz	0.004

Physical properties

Tensile modulus, psi	510,000
Coefficient of thermal expansion at 200°C, ppm/°C	24
Moisture uptake at 100% relative humidity, %	3.4
Refractive index	1.59
Shrinkage, %	8

Thermal properties

T _g , °C	>400
TGA, 1% weight loss in N ₂ , °C	490

*Maximum cure temperature = 350°C. Test methods available upon request

Availability and storage

Ultradel 7505 Coating solutions are available in 250 and 500 gram quantities. These solutions are sensitive to UV radiation and should always be handled under yellow light. This material can be stored at room temperature for up to six months without loss of properties. Moisture can affect product performance and should be avoided. Keep bottles capped when not in use.

Health and safety

Always refer to the Material Safety Data Sheet (MSDS) supplied with the material. Adequate ventilation is required when handling all Ultradel products. Skin and eye contact should be avoided. Exposed areas should be immediately flushed with water. For additional safety information regarding Ultradel products, call toll-free 1-800-447-8735.



ULTRADEL® 7505

MATERIAL SAFETY DATA SHEET

For use only as microelectronic coating

MSDS No. 08471000
ENGLISH

1.0 CHEMICAL PRODUCT AND COMPANY IDENTIFICATION**PRODUCT NAME:** ULTRADEL® 7505**MANUFACTURER/SUPPLIER:**
Amoco Chemical Company
200 East Randolph Drive
Chicago, Illinois 60601 U.S.A.**EMERGENCY HEALTH INFORMATION:**
1 (800) 447-8735**EMERGENCY SPILL INFORMATION:**
1 (800) 424-9300 CHEMTREC (USA)**OTHER PRODUCT SAFETY INFORMATION:**
(312) 856-3304

2.0 COMPOSITION/INFORMATION ON INGREDIENTS

<u>Component</u>	<u>CAS#</u>	<u>Range % by Wt.</u>
Gamma-butyrolactone	96-48-0	75-90
Polyimide	Trade Secret	10-25

(See Section 8.0, "Exposure Controls/Personal Protection", for exposure guidelines)

3.0 HAZARDS IDENTIFICATION**EMERGENCY OVERVIEW:** Warning! Causes eye irritation. Prolonged or repeated contact can defat the skin and lead to irritation and/or dermatitis. Causes respiratory irritation. Inhalation causes headaches, dizziness, drowsiness, and nausea, and may lead to unconsciousness. If swallowed, causes headaches, dizziness, drowsiness and nausea, and may lead to unconsciousness.**POTENTIAL HEALTH EFFECTS:****EYE CONTACT:** Causes eye irritation.**SKIN CONTACT:** Prolonged or repeated contact can defat the skin and lead to irritation and/or dermatitis.**INHALATION:** Causes respiratory irritation. Inhalation causes headaches, dizziness, drowsiness, and nausea, and may lead to unconsciousness.**INGESTION:** If swallowed, causes headaches, dizziness, drowsiness and nausea, and may lead to unconsciousness.**HMIS CODE:** (Health:2) (Flammability:1) (Reactivity:0)**NFPA CODE:** (Health:2) (Flammability:1) (Reactivity:0)

4.0 FIRST AID MEASURES

EYE: Immediately flush eyes with plenty of water for at least 15 minutes. Then get immediate medical attention.

SKIN: Wash exposed skin with soap and water. Remove contaminated clothing and thoroughly clean and dry before reuse. Get medical attention if irritation develops.

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

INGESTION: If swallowed, drink plenty of water, induce vomiting. Get immediate medical attention.

5.0 FIRE FIGHTING MEASURES

FLASHPOINT: 201°F(94°C) ASTM D93

UEL: Not determined.

LEL: Not determined.

AUTOIGNITION TEMPERATURE: Not determined.

FLAMMABILITY CLASSIFICATION: None

EXTINGUISHING MEDIA: Agents approved for Class B hazards (e.g., dry chemical, carbon dioxide, foam, steam) or water fog.

UNUSUAL FIRE AND EXPLOSION HAZARDS: None identified.

FIRE-FIGHTING EQUIPMENT: Firefighters should wear full bunker gear, including a positive pressure self-contained breathing apparatus.

HAZARDOUS COMBUSTION PRODUCTS: Burning can produce carbon monoxide and/or carbon dioxide and other harmful products.

6.0 ACCIDENTAL RELEASE MEASURES

Remove mechanically or contain on an absorbent material such as dry sand or earth.

7.0 HANDLING AND STORAGE

HANDLING: Use with adequate ventilation. Keep container closed.

STORAGE: Store in cool, dry, well-ventilated area. Keep container closed. Store in dark; minimize exposure to oxygen.

8.0 EXPOSURE CONTROLS / PERSONAL PROTECTION

EYE: Do not get in eyes. Wear chemical goggles.

SKIN: Do not get on skin or clothing. Wear protective clothing and gloves.

INHALATION: Use with adequate ventilation. If ventilation is inadequate, use NIOSH/MSHA certified respirator that will protect against organic vapor and dust/mist.

ENGINEERING CONTROLS: Control airborne concentrations below the exposure guidelines.

EXPOSURE GUIDELINES:

<u>Component</u>	<u>CAS#</u>	<u>Exposure Limits</u>
Gamma-butyrolactone	96-48-0	No exposure limit established
Polyimide	Trade Secret	No exposure limit established

9.0 CHEMICAL AND PHYSICAL PROPERTIES

APPEARANCE AND ODOR:	Viscous liquid. Clear. Yellow.
pH:	Not determined.
VAPOR PRESSURE:	Not determined.
VAPOR DENSITY:	Not determined.
BOILING POINT:	399°F(204°C) (estimate)
MELTING POINT:	Not determined.
SOLUBILITY IN WATER:	Totally insoluble.
SPECIFIC GRAVITY (WATER = 1):	1.1 (estimate)
VISCOSITY:	30000 cP at 20°C (approximate)

10.0 STABILITY AND REACTIVITY

STABILITY: Product is moisture sensitive. Product is photosensitive.

CONDITIONS TO AVOID: Protect from UV light. Avoid exposure to moisture or moist air.

MATERIALS TO AVOID: Avoid chlorine, fluorine, and other strong oxidizers.

HAZARDOUS DECOMPOSITION: None identified.

HAZARDOUS POLYMERIZATION: Will not occur.

11.0 TOXICOLOGICAL INFORMATION

ACUTE TOXICITY DATA:

EYE IRRITATION: Testing not conducted. See Other Toxicity Data.

SKIN IRRITATION: Testing not conducted. See Other Toxicity Data.

DERMAL LD50: Testing not conducted. See Other Toxicity Data.

ORAL LD50: Testing not conducted. See Other Toxicity Data.

INHALATION LC50: Testing not conducted. See Other Toxicity Data.

OTHER TOXICITY DATA:

Specific toxicity tests have not been conducted on this product. Our hazard evaluation is based on information from similar products, the ingredients, technical literature, and/or professional experience.

No component of this product at levels greater than 0.1% is identified as a carcinogen by ACGIH or the International Agency for Research on Cancer (IARC). No component of this product present at levels greater than 0.1% is identified as a carcinogen by the U.S. National Toxicology Program (NTP) or the U.S. Occupational Safety and Health Act (OSHA).

12.0 ECOLOGICAL INFORMATION

Ecological testing has not been conducted on this product.

13.0 DISPOSAL INFORMATION

Disposal must be in accordance with applicable federal, state, or local regulations. Determine waste classification at time of disposal. Conditions of use may render the spent product a hazardous waste. Enclosed-controlled incineration is recommended unless directed otherwise by applicable ordinances.

Since the emptied containers retain product residue, follow label warnings even after container is emptied.

14.0 TRANSPORTATION INFORMATION

U.S. DEPT OF TRANSPORTATION

Shipping Name : Not Regulated

INTERNATIONAL INFORMATION:

Sea (IMO/IMDG)
Shipping Name : Not Regulated

Air (ICAO/IATA)
Shipping Name : Not Regulated

European Road/Rail (ADR/RID)
Shipping Name : Not determined.

Canadian Transportation of Dangerous Goods
Shipping Name : Not Regulated

15.0 REGULATORY INFORMATION

CERCLA SECTIONS 102A/103 HAZARDOUS SUBSTANCES (40 CFR PART 302.4): This product is not reportable under 40 CFR Part 302.4.

SARA TITLE III SECTION 302 EXTREMELY HAZARDOUS SUBSTANCES (40 CFR PART 355): This product is not regulated under Section 302 of SARA and 40 CFR Part 355.

SARA TITLE III SECTIONS 311/312 HAZARDOUS CATEGORIZATION (40 CFR PART 370): This product is defined as hazardous by OSHA under 29 CFR Part 1910.1200(d). Hazardous categories for this product are: Acute = yes; Chronic = no; Fire = no; Pressure = no; Reactive = no.

SARA TITLE III SECTION 313 (40 CFR PART 372): This product is not regulated under Section 313 of SARA and 40 CFR Part 372.

U.S. INVENTORY (TSCA): Listed on inventory.

OSHA HAZARD COMMUNICATION STANDARD: Irritant. CNS Effects.

WHMIS CONTROLLED PRODUCT CLASSIFICATION: D2B,

EC INVENTORY (EINECS/ELINCS): In compliance.

JAPAN INVENTORY (MITI): One or more components not listed on inventory - For research and development purposes only.

AUSTRALIA INVENTORY (AICS): One or more components not listed on inventory - For research and development purposes only.

KOREA INVENTORY (ECL): Not determined.

CANADA INVENTORY (DSL): One or more of the components of this product is not listed on the DSL.

PHILIPPINE INVENTORY (PICCS): Not determined.

16.0 OTHER INFORMATION

BY:

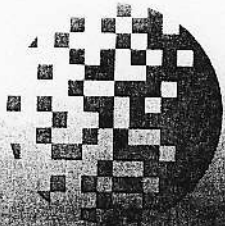


Donald M. Barker, Director
Product Stewardship & Toxicology

Issued: August 04, 1994
Supersedes: July 27, 1993

This material Safety Data Sheet conforms to the requirements of ANSI Z400.1.

This material safety data sheet and the information it contains is offered to you in good faith as accurate. We have reviewed any information contained in this data sheet which we received from sources outside our company. We believe that information to be correct but cannot guarantee its accuracy or completeness. Health and safety precautions in this data sheet may not be adequate for all individuals and/or situations. It is the user's obligation to evaluate and use this product safely and to comply with all applicable laws and regulations. No statement made in this data sheet shall be construed as a permission or recommendation for the use of any product in a manner that might infringe existing patents. No warranty is made, either express or implied.



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ULTRADEL® MICROELECTRONIC COATING

ULTRADEL 7505

Lot 18674037

Tested on 07/26/95

Property


Brookfield, cps
Solids Content, %
Filtration, μ

Test Results

45,200
15.1
1.0

A spin curve is attached.

DAVID A. WARGOWSKI



QUALITY ASSURANCE MANAGER
NAPERVILLE, IL



DATE

Thickness vs Spin Speed

Ultradel® 7505

