



The MSDS format adheres to the standards and regulatory requirements of the United States and may not meet regulatory requirements in other countries.

DuPont  
Material Safety Data Sheet

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PYRALUX(R) LF ADHESIVE (VAPORS)  
VPS00028 Revised 14-AUG-2004  
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CHEMICAL PRODUCT/COMPANY IDENTIFICATION  
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Material Identification

PYRALUX is a registered trademark of DuPont.

Product Use

In keeping with DuPont's continuing commitment to safety and the environment, we are providing this MSDS as a service to our customers. This product is classified as non-hazardous under OSHA's Hazard Communication Standard (29 CFR 1910.1200). Pyralux(r) products do create off-gases in normal use. These off-gases are regulated, but are present at such low levels during normal use that no hazardous exposure is anticipated.

Tradenames and Synonyms

Standard Pyralux  
Vapors from Pyralux LF Bond Ply  
Vapors from Pyralux LF Coverlay  
Vapors from Pyralux LF Copper-Clad Laminate

Tradenames and Synonyms (Remarks)

Pyralux (R) LF is the product name of a family of products consisting of flexible Copper Clad Laminates, Coverlay, Bond Ply, and Sheet Adhesive. This MSDS focuses on the vapors that may evolve from the adhesive during processing of any one of these products.

The Clads are made of copper foil laminated to polyimide film with an adhesive. The Coverlay and Bond Ply are made of polyimide film with an adhesive, and the Sheet Adhesive is just adhesive.

Company Identification

MANUFACTURER/DISTRIBUTOR  
DuPont  
1007 Market Street  
Wilmington, DE 19898

PHONE NUMBERS

Product Information : 1-800-441-7515 (outside the U.S.  
302-774-1000)  
Transport Emergency : CHEMTREC 1-800-424-9300(outside U.S.  
703-527-3887)  
Medical Emergency : 1-800-441-3637 (outside the U.S.  
302-774-1000)

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COMPOSITION/INFORMATION ON INGREDIENTS  
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## Components

Material	CAS Number	%
The following vapors may be evolved during press lamination and baking (160-200 deg C)		
*PHENOL	108-95-2	0-60
*1-BUTANOL	71-36-3	0-20
*BUTYL ACRYLATE	141-32-2	1-5
UNKNOWN AROMATIC COMPOUND		0-5
2-HYDROXY-BENZALDEHYDE		5-10
4-HYDROXY-BENZALDEHYDE		0-5
BENZOATE COMPOUNDS		0-5
METHYL PHENOL ISOMERS		0-5
PHTHALATE COMPOUNDS		30-60
UNKNOWN ALKYL COMPOUNDS		30-60
BENZOPHENONE	119-61-9	1-10
*METHANOL	67-56-1	0-40
POLYSILOXANE		1-10

\* Disclosure as a toxic chemical is required under Section 313 of Title III of the Superfund Amendments and Reauthorization Act of 1986 and 40 CFR part 372.

## Components (Remarks)

THE CONCENTRATIONS ARE BASED ON GC/MS ANALYSES OF FILM VAPORS IN LAMINATION AND BAKING, THE PRINCIPLE STEPS WHERE VAPOR EVOLUTION OCCURS. THE QUANTITY OF VAPORS IS ESTIMATED TO BE 10-15 lbs per 100,000 SQ FEET OF ADHESIVE. VAPOR EVOLUTION RESULTS ARE BASED ON THE PERCENTAGE OF WEIGHT LOSS MEASURED BY THERMAL GRAVIMETRIC ANALYSIS (TGA). THIS WEIGHT LOSS INCLUDES WATER VAPOR. THE POUNDS OF VAPOR ARE NOT ALL "VOC'S" AS "DEFINED" BY THE EPA FOR CLEAN AIR ACT PURPOSE.

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HAZARDS IDENTIFICATION  
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## Potential Health Effects

As a part of the hazard assessment process, DuPont has conducted industrial hygiene studies to monitor the potential exposure to the off-gases from this product during normal use. Conclusions from the results of these studies indicate that exposure levels during press lamination using adequate ventilation were well below regulated limits (e.g. an order of magnitude below the exposure limit). Tests run for nuisance dust levels at a drilling/routing station with vacuum exhaust also indicated exposure levels well below regulated limits.

As a result of this test data, DuPont believes the potential exposure to the vapors and dusts of this product is minimal.

## (HAZARDS IDENTIFICATION - Continued)

Equipment used for lamination and curing must be adequately exhausted. Consult the DuPont publication "Pyralux Safe Handling". Additional information provided in "Handling & Safety Considerations for the Pyralux PC Curing Process" may also be helpful.

## POTENTIAL HUMAN HEALTH EFFECTS OF OVEREXPOSURE:

Inhalation may cause irritation of the upper respiratory passages, with sneezing, coughing and discomfort; or temporary lung irritation effects with cough, discomfort, difficulty breathing, or shortness of breath.

Inhalation, ingestion or skin contact may cause temporary mild depression of the central nervous system with dizziness, confusion, incoordination or drowsiness followed by an asymptomatic period usually ranging from 12 to 24 hours. There are reports that suggest headache, hearing loss and vertigo (dizziness) in workers exposed to less than 110 ppm of 1-Butanol.

Skin contact may cause redness of the skin and dermatitis with itching or rash. Evidence from animal testing on some vapor components suggests that skin permeation can occur in amounts capable of producing the effects of systemic toxicity.

Eye contact with high concentrations of vapors may cause eye irritation with discomfort, tearing or blurring of vision.

Individuals with pre-existing diseases of the central nervous system, liver or kidneys may have increased susceptibility to the toxicity of excessive exposures.

Some compounds have been infrequently associated with skin sensitization in humans.

## Carcinogenicity Information

None of the components present in this material at concentrations equal to or greater than 0.1% are listed by IARC, NTP, OSHA or ACGIH as a carcinogen.

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FIRST AID MEASURES  
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## First Aid

## INHALATION

If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Call a physician.

## (FIRST AID MEASURES - Continued)

## SKIN CONTACT

Flush skin with water after contact. Wash contaminated clothing before reuse.

## EYE CONTACT

In case of contact, immediately flush eyes with plenty of water for at least 15 minutes. Call a physician.

## INGESTION

Ingestion is not considered a potential route of exposure.

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FIRE FIGHTING MEASURES  
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## Flammable Properties

Flammable limits in Air, % by Volume  
LEL : not determined  
UEL : not determined

## Extinguishing Media

Use media appropriate for surrounding material.

## Fire Fighting Instructions

Evacuate personnel to a safe area. Keep personnel removed and upwind of fire. Wear self-contained breathing apparatus. Runoff from fire control may be a pollution hazard.

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ACCIDENTAL RELEASE MEASURES  
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## Safeguards (Personnel)

NOTE: Review FIRE FIGHTING MEASURES and HANDLING (PERSONNEL) sections before proceeding with clean-up. Use appropriate PERSONAL PROTECTIVE EQUIPMENT during clean-up.

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HANDLING AND STORAGE  
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## Handling (Personnel)

Do not breathe vapor or mist. Do not breathe dust. Do not get in eyes. Do not store or consume food, drink or tobacco in areas where they may become contaminated with this material.

Good industrial hygiene procedures include washing hands after handling.

## (HANDLING AND STORAGE - Continued)

## Storage

Do not store or consume food, drink or tobacco in areas where they may become contaminated with this material.

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EXPOSURE CONTROLS/PERSONAL PROTECTION  
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## Engineering Controls

Use only with adequate ventilation.

## Personal Protective Equipment

Eye/Face : Safety Glasses.  
Respirator : USE ADEQUATE VENTILATION WHEN CUTTING OR HEATING.

## # Exposure Guidelines

## Applicable Exposure Limits

## PHENOL

PEL (OSHA) : 5 ppm, 19 mg/m<sup>3</sup>, 8 Hr. TWA, Skin  
TLV (ACGIH) : 5 ppm, 19 mg/m<sup>3</sup>, 8 Hr. TWA, Skin, A4  
AEL \* (DuPont) : None Established

## 1-BUTANOL

PEL (OSHA) : 100 ppm, 300 mg/m<sup>3</sup>  
TLV (ACGIH) : 20 ppm, 8 Hr. TWA  
AEL \* (DuPont) : 25 ppm, 8 Hr. TWA  
50 ppm, 15 minute TWA

## BUTYL ACRYLATE

PEL (OSHA) : None Established  
TLV (ACGIH) : 2 ppm, 8 Hr. TWA, A4  
Sensitizer  
AEL \* (DuPont) : 2 ppm, 8 & 12 Hr. TWA, Skin

## BENZOPHENONE

PEL (OSHA) : None Established  
TLV (ACGIH) : None Established  
AEL \* (DuPont) : None Established  
WEEL (AIHA) : 0.5 mg/m<sup>3</sup>, 8 Hr. TWA

## METHANOL

PEL (OSHA) : 200 ppm, 260 mg/m<sup>3</sup>, 8 Hr. TWA  
TLV (ACGIH) : 200 ppm, 8 Hr. TWA, Skin  
STEL 250 ppm  
AEL \* (DuPont) : 200 ppm, 8 & 12 Hr. TWA, Skin

\* AEL is DuPont's Acceptable Exposure Limit. Where governmentally imposed occupational exposure limits which are lower than the AEL are in effect, such limits shall take precedence.

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PHYSICAL AND CHEMICAL PROPERTIES  
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## Physical Data

% Volatiles : 2.0 WT% WATER + VAPORS LISTED ABOVE.  
Odor : NONE  
Form : SOLID SHEET  
Color : OFF-WHITE

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STABILITY AND REACTIVITY  
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## Chemical Stability

Stable at normal temperatures and storage conditions.

## Incompatibility with Other Materials

None reasonably foreseeable.

## Decomposition

Decomposes with heat.

SEE COMPOSITION INFORMATION FOR VAPOR INFORMATION.

## Polymerization

Polymerization can occur.

Conditions leading to polymerization are HEAT AND PRESSURE

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TOXICOLOGICAL INFORMATION  
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## Animal Data

## BUTYL ACRYLATE

Skin absorption LD50, rabbit: 1,780 mg/kg  
Ingestion LD50, rat : 6,170 mg/kg  
Inhalation 4 hour, LC50, rat: 2, 636 ppm

## PHENOL

Skin absorption LD50, rabbit: 1669mg/kg  
Oral LD50, rat : 414 mg/kg  
Inhalation 8 hour, LC50, rat: > 234 ppm

## BENZOPHENONE

Inhalation 4 hour, ALC, rat : > 330 ppm  
Skin absorption LD50, rabbit: 3535 mg/kg  
Oral LD50, mice : 2895 mg/kg

## METHANOL

Oral LD50, rat : 9,100 mg/kg

## (TOXICOLOGICAL INFORMATION - Continued)

Dermal LD50, rabbit : 15,840 mg/kg  
Inhalation 1 hour, LC50, rat: > 145,000 ppm

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DISPOSAL CONSIDERATIONS  
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## Waste Disposal

Treatment, storage, transportation, and disposal must be in accordance with applicable Federal, State/Provincial, and Local regulations. Do not burn.

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REGULATORY INFORMATION  
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## U.S. Federal Regulations

TSCA Inventory Status : In compliance with TSCA Inventory requirements for commercial purposes.

## State Regulations (U.S.)

WARNING - SUBSTANCES KNOWN TO THE STATE OF CALIFORNIA TO CAUSE CANCER, BIRTH DEFECTS OR OTHER REPRODUCTIVE HARM- acrylonitrile-  
<0.1 %

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OTHER INFORMATION  
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## Additional Information

MEDICAL USE: CAUTION: Do not use in medical applications involving permanent implantation in the human body. For other medical applications see DuPont CAUTION Bulletin No. H-50102.

## PRECAUTIONARY STATEMENTS FOR VAPOR CONDENSATE AND VACUUM PUMP OIL:

WARNING! CAUSES EYE, SKIN AND RESPIRATORY IRRITATION.

Oil in vacuum pump will collect and concentrate less volatile components. Condensate will contain higher percentages of less volatile components. The less volatile components may include acrylate monomers which may cause delayed skin burns and may cause skin sensitization. Avoid contact with eyes, skin and clothing. Avoid breathing mist or vapor. Wash thoroughly with soap and water after handling. Laminators and curing equipment used to process PYRALUX(R) films should be designed with adequate ventilation to exhaust these vapors from the workplace. Vapors may condense on cold surfaces in exhaust ducts. Check these surfaces for condensate build-up before handling.

(Continued)

INFORMATION ON THE CLEAN AIR ACT OF 1990 TITLE VI,  
SECTION 611: CONCERNING OZONE DEPLETING SUBSTANCES -

DuPont Riston (R), Vacrel (R), VALU (TM), and Pyralux (R)  
photopolymer resists and sold masks do NOT contain and  
are NOT manufactured with either Class I or Class II Ozone  
Depleting Substances.

For further information regarding the safe use of this  
material, please refer to DuPont technical bulletin  
"Handling and Safety Considerations for the PYRALUX(R) PC  
Curing Process."

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The data in this Material Safety Data Sheet relates only to the  
specific material designated herein and does not relate to use in  
combination with any other material or in any process.

DUPONT iTECHNOLOGIES  
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919-248-5345 OR 919-248-5027

# Indicates updated section.

This information is based upon technical information believed to be  
reliable. It is subject to revision as additional knowledge and  
experience is gained.

End of MSDS