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POLYGUIDE™ Clad Laminates ***Handling/Processing Guide***

The handling procedures that follow have been developed in practice and are recommended for POLYGUIDE. Although each user may vary these techniques somewhat, depending on the handling facilities or needs, you should be guided by the recommended procedures in order to achieve optimum results.

Polyflon Company will answer specific inquiries relating to handling procedures.

HANDLING

1. Storage

- a) POLYGUIDE should be stored at or near room temperature (72-75°F). The material should always lie flat. Never store quantities of POLYGUIDE or any other flexible polyolefin laminate on edge. Individual sheets of material should not be rested on edge for lengthy periods, particularly when the temperature of the material differs from room temperature. Failure to observe these simple rules can result in curling of the laminate. In most cases, material flatness can be restored by laying the sheet on a flat surface for a period of time or by simply bending it into shape.

PHOTO-PROCESSING PROCEDURES

1. Photoresist coating

Cleaning

Pre-cleaning should be accomplished using standard chemical soak baths. All baths should be used at a temperature of less than 90°F to reduce curling. Mechanical scrubbers can be used with care. Maintain minimum brush pressure and only use bristle brushes.

Photoresist coating

The use of a dry film photoresist, such as DuPont 4600 series or Dynachem Type GA, is recommended. Other manufactures and other types have been used successfully.

Laminating should be accomplished using the minimum temperature and roller pressure and maximum thru put speed which will provide good adhesion of the photoresist being used. A suggested starting point, when using DuPont Riston Type 4615 and a DuPont HR24, is 105°C. roller temperature, 10 to 15 psi pressure on the rollers and 7 to 8 feet per minute speed.

Exposing

During the exposing procedure there is always a tendency for the vacuum frame glass to heat. Excessive heating of the glass will cause curling of the laminate. POLYGUIDE should not be exposed when the vacuum frame glass becomes warm to the touch (100°F) as occurs in multiple exposures. If excessive heating of the glass occurs, the use of a fan to cool the glass is recommended. Today's high intensity exposure units can be used for processing POLYGUIDE and standard exposure times can be used.

Developing

Dry film photoresist is normally developed in a 3% solution of Sodium Carbonate at 90°F. This is not detrimental to POLYGUIDE laminate. If other developer solutions are to be used, it is suggested that the user make test runs and do not allow the solution temperature to exceed 100°F.



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ETCHING PROCEDURES

Most commercial etching agents can be used to process POLYGUIDE. The substrate is very resistant to acids and alkalis. The substrate is also resistant to most organic solvents at room temperature and particularly resistant to high temperature swelling in trichloroethylene and similar solvents used in cleaning circuit boards.

Processing may be accomplished using standard spray etching methods. The etching bath should be maintained at a temperature of less than 110°F. A temperature of 70-80°F is highly recommended. Avoid subjecting the circuit board to temperatures above 110°F. A thermostatically controlled etching bath is the ideal choice. For best performance use a commercial grade ferric chloride, 1.39 to 1.41 specific gravity at 68°F. as the etching agent. Check the copper content of the etching bath by calorimetric techniques (or one of similar simplicity) to an amount not exceeding 2 ounces of copper per gallon.

Other etching solutions, such as ammonium chloride-ammonium hydroxide can be used. The operating temperature should be maintained at 110°F. or less. Cupric chloride may be used, however, the operating temperature should be maintained at 110°F. or less.

DO not use a "high speed" etchant as the operating temperature is too high for processing POLYGUIDE.

When processing circuitry which requires that extremely close tolerances between adjacent lines must be held, it is generally better to use an etching bath which has been worked. A fresh bath works more actively and 'bites' harder than is desired for such close tolerance procedures.

'Etching by inspection' is recommended in this case. The operator should withdraw the board or boards approximately half way through the etching cycle for inspection. Depending on the degree of etch, the operator should then withdraw the circuit at frequent intervals, stopping the process when the desired tolerance has been achieved. It is recommended that each time the board is removed from the bath for inspection, it is rotated 180 degrees before being re-immersed. This ensures that the critical areas are evenly and cleanly etched. For complicated circuits with several critical tolerance areas, etching by inspection should be carried out, each critical area being masked as it achieves the proper degree of etching.

Since POLYGUIDE is a relatively soft material, some warping or curling will occur during or after etching. The degree of curling experienced depends on the size of the etched piece, thickness of dielectric and copper, and etch area. It is obvious that a large thick board, thinly clad and lightly etched will curl less than a small thin board heavily clad and etched. The size of the etched board is the major factor in curling. It is suggested that with uneven copper, as in circuits with full ground planes, and when using horizontal spray etchers, the circuit side of the board should be placed in the down position.

PHOTORESIST REMOVAL

Dry film photoresist is normally developed in a 3% solution of Sodium Hydroxide at 90°F. This is not detrimental to POLYGUIDE laminate. If other stripping solutions are to be used, it is suggested that the user make test runs and do not allow the solution temperature to exceed 100°F.

Processing may be accomplished with any of the following stripping systems:

Spray systems including both horizontal and vertical work positions, single and double side stripping.

Splash stripping by paddle wheel and air driven splash

Deep tank or immersion stripping.

The stripping bath should be maintained at a temperature less than 110°F. A temperature of 80-90°F is highly recommended. Avoid subjecting the circuit board to temperatures above 110°F. A



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thermostatically controlled stripping system the ideal choice. It is suggested that with uneven copper, as in circuits with full ground planes, and when using horizontal spray strippers, the circuit side of the board should be placed in the down position.

PLATING

Material is recommended for applications that do **not** include plated holes. If front to back continuity is required, we would recommend using eyelets. Contact us for recommendation on specific eyelets.

Regarding finish plating of copper areas, any room temperature electroless plating system is satisfactory, providing the maximum substrate temperature is not exceeded. Plating processes that involve temperatures near 150°F are not recommended.

ASSEMBLY

Whether the final circuit is to be riveted or bolted together, consideration should be given to pressure exerted on the laminate by fastening when the circuit is to function in high ambient (i.e. 160°F) temperatures. Steps should be taken to distribute fastener pressure over the widest possible area in order to prevent distortion of the circuit board at elevated temperatures. It is estimated that maximum unit pressure should not exceed 3060 psi. Practice has demonstrated that intelligent design and empirical testing of circuitry under storage and operating conditions is the best guide.

MACHINING

General practice for machining polyolefin for minimum burring dictates the following order of tool preference: 1) Straight fluted end mills; 2) Minimum spiral two lip end mills; 3) Right hand cut with left hand spiral end mills. Power or foot operated shears are used to cut POLYGUIDE sheet in thickness' up to approximately 1/4 inch. A band or table saw is recommended for the thicker sizes and also for the smaller sizes when shears are not available.

IN SUMMARY

The successful processing of POLYGUIDE and other unsupported laminates requires attention to two basic principles:

The material should always be stored or rested on a flat surface at or near room temperature.
The material should, if possible, be handled and processed at or near room temperature.

Although irradiated polyolefin is an extremely tough material, it has a degree of flexibility not inherent in other types of laminates. The flexibility of the material makes it susceptible to curling under moderate temperature excursions before packaging. Proper storing, processing and handling minimizes curling.

The information contained herein is not intended to, and does not create any warranty, express or implied, including any warranty of suitability for a particular application, nor the appropriateness of one fabrication technique over another.

Data subject to change without notice.

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MICROWAVE MATERIALS

CIRCUIT PROCESSING

MICROWAVE COMPONENTS

ELECTROPLATED PTFE

HV/RF CAPACITORS