

# DuPont Electronic Technologies

## DuPont™ Pyralux® Flexible Laminates Technical Bulletin

This document outlines the results of a technical investigation on the use of 1 mil thick DuPont™ Pyralux® AP in multi-layer constructions where the polyimide core is bonded directly to Pyralux® LF sheet adhesive or bondply. This investigation was initiated as a result of two reports of intermittent failures where blistering of the internal layers occurred after a thermal excursion.

### Analysis

Internal evaluations indicate that the root cause of this failure is the presence of moisture in the package. This subsequently caused blistering after a thermal excursion. It was previously believed that the required bake times for a given construction were typically not affected by the specific types of Pyralux® materials used. However, the testing done indicates that the amount of time needed to sufficiently remove moisture from the package will depend on the thickness of the Pyralux® AP and the type of adhesive used for bonding. Counter-intuitively, the 1 mil product requires more baking time to remove moisture than the 2 mil product.

Note that this applies only to multilayer constructions where the polyimide core is bonded directly to Pyralux® LF sheet adhesive or bondply and not to the bulleted constructions noted at the end of this document.

Specifically, internal evaluations have demonstrated the following:

- After exposure to equal drying conditions, 1 mil Pyralux® AP will blister more readily than 2 mil Pyralux® AP during a thermal excursion. As shown in the table, required bake times for this combination of materials may be 3-4x longer than standard.
- After exposure to equal drying conditions, 1 mil Pyralux® AP, in combination with Pyralux® FR adhesive, is more resistant to blistering than if used with Pyralux® LF adhesive. As shown in the table, required bake times for this combination of materials may be 1.2-1.5x longer than standard.
- Pyralux® AP thicknesses of 2 mils or greater, used in combination with either Pyralux® LF or FR adhesive, only require standard bake times.



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The table below compares relative bake times for various material combinations.

AP Thickness	Adhesive Type	Relative Baking Time
2 mil	FR	standard
2 mil	LF	standard
1 mil	FR	extended (may require 1.2-1.5x standard conditions)
1 mil	LF	extended (may require 304x standard conditions)

## Conclusions

The amount of moisture in a given construction prior to lamination and also after lamination prior to a thermal excursion will determine the likelihood of the package to blister. In addition, the specific thickness of AP and the type of adhesive used will affect the drying times required to avoid blistering. Many factors can result in excessive moisture, including environmental conditions, lag times between baking and thermal processing, layer count and copper density in a given layer. Consequently, the amount of time needed to properly dry a given package can vary widely and must be determined by users on a case-by-case basis.

Additional information can be found in the DuPont™ Pyralux® technical manual.

To minimize the likelihood of blisters occurring during a thermal excursion, the use of 2 mil Pyralux® AP is recommended over the 1 mil product. However, if the design requires the use of 1 mil thick Pyralux® AP, then the use of Pyralux® FR as the bonding adhesive is recommended.

The testing done has not revealed similar issues with 1 mil Pyralux® AP clads used in any of the other stackup configurations listed below.

- Single-sided or double-sided configurations of Pyralux® AP with Pyralux® LF or FR coverlayers
- Pyralux® AP innerlayers in rigid printed circuit board multilayers
- Pyralux® AP as the flex layers in rigid printed circuit board multilayer boards where the 1 mil Pyralux® AP di-clads are bonded with either epoxy or polyimide prepreps.

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