

Technical Bulletin

Subject: Desmear compatibility of “Bullseye™” drill entry from LCOA

Date: 03-April-2009

Consideration of all materials used in the mechanical via and hole formation is important. Everything from reducing smear of the PCB materials to possible carry-in of the entry and back-up materials is important. When new materials are introduced, compatibility testing with standard plating processes is required.

The first step in a PTH process is the desmear. This is done with either plasma or immersion in permanganate. Permanganate is used for the testing below because it is more common and less aggressive than plasma.

As we introduce new laminates and prepregs, a weight loss test is used to evaluate the effectiveness of the desmear process. We can advise the customer on effectiveness and dwell times as well as the requirement for plasma if permanganate is ineffective. The form we use is below:

Permanganate Weight Loss Test

Material Type	
Thickness	
Date	

Coupon Prep.

It is important that the coupon be prepared without rough edges. Any mechanical material loss will produce erroneous results. Care must be taken throughout the test to prevent mechanical damage to the coupon.

- Strip the copper off of the laminate to be tested.
- Cut the bare laminate into accurately measured 3" x 3" and scribe a label.
- Bake the coupon(s) for a minimum of 15 minutes at 120°C (248°F).
- Cool and weigh accurately to four decimal places.
- Process through the desmear/etchback cycle to be evaluated.
- Dry the coupon(s) and bake for 2 hours at 120°C (248°F).
- Cool and reweigh the coupon(s)
- Calculation:

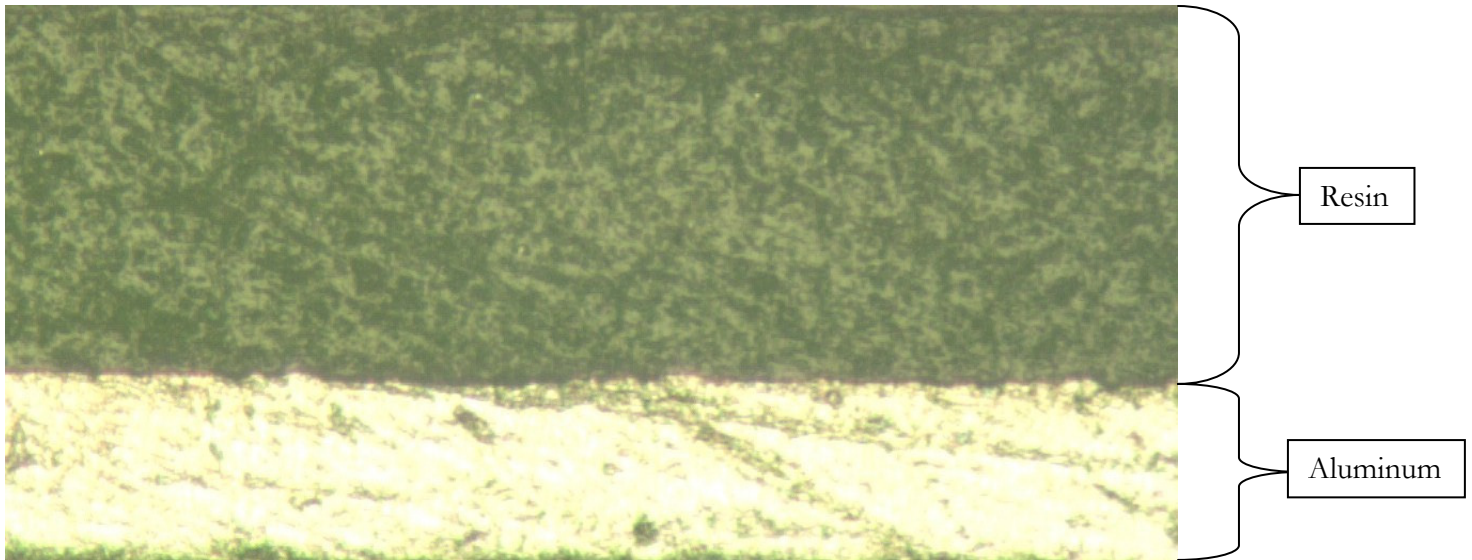
$$\text{Weight loss (mg/cm}^2\text{)} = [\text{Initial Weight (mg)} - \text{Final Weight (mg)}] / \text{surface area (cm}^2\text{)}$$

Note: A 3" x 3" coupon equals 116.1288 cm².

Initial Weight				
Bake				
	Pass 1		Pass 2 (if applicable)	
	Time	Temp	Time	Temp
Sweller				
Permaganate				
Neutralizer				
Bake				
Final Weight				
Weight loss				
Mg/cm ²				

Weight loss is effective in determining the amount of removal. If any material is deposited in the hole wall from drilling, this test will determine if it is easily removed.

Bullseye™ is a layered product.



Permanganate desmear chemistries are alkaline so the aluminum base must first be removed from the test coupons first so only the weight loss from the resin is tested.

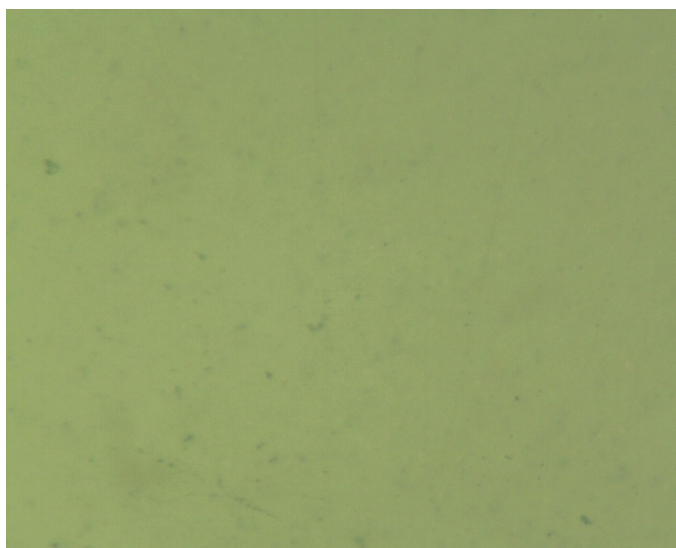


1.0N sodium hydroxide at room temperature is used to remove the aluminum from the test coupons. This solution removes the aluminum slowly and will not attack the resin costing.

After the aluminum was dissolved, the surface was inspected at 200x to ensure no attack/removal of the resin occurred.

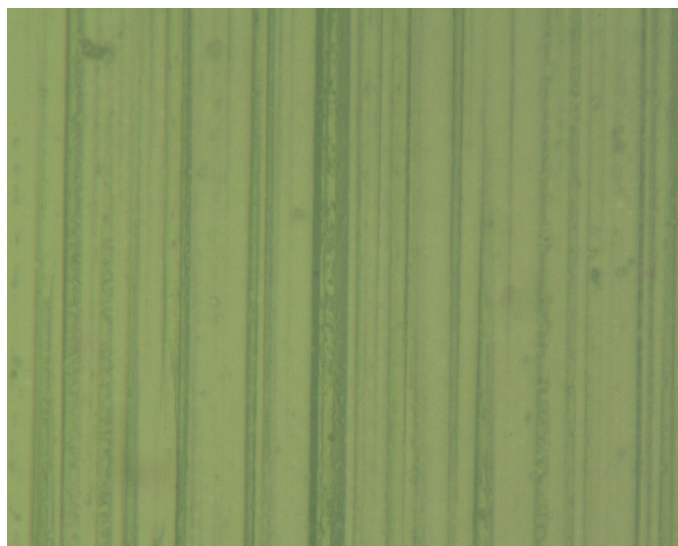


Bullseye™ surface before
aluminum stripping.



Bullseye™ surface after
aluminum stripping.

Bullseye™ surface after
aluminum stripping,
aluminum side.



There was no evidence of attack from the 1.0N sodium hydroxide. The surface stayed shiny in appearance and the side formerly in contact with the aluminum exhibited a mirror image of the aluminum rolling marks.

Desmear process used:

Rohm Haas Chemistries- MLB -211 (butyl/caustic) sweller
3308 (permanganate)
3314 neutralizer

Dwell times used were the same for FR-4 epoxy;
5 minutes in sweller- 12 minutes in the permanganate-5 minutes in the neutralizer.

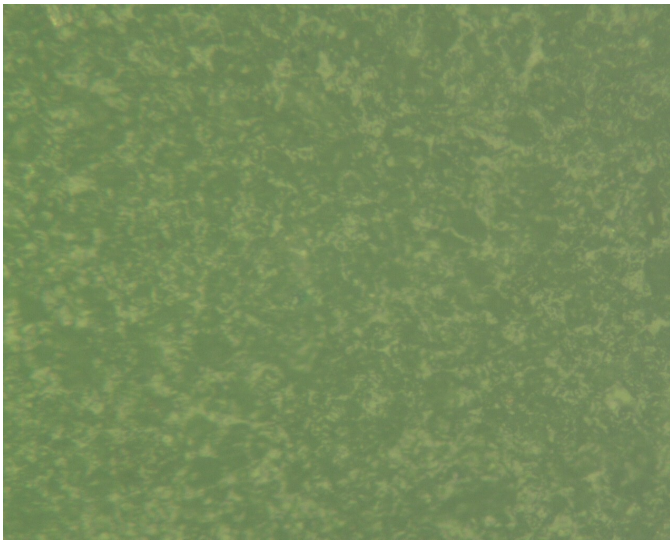
Testing on the Bullseye™ resin was done two ways, the standard process above and standard process skipping the sweller.

Results:

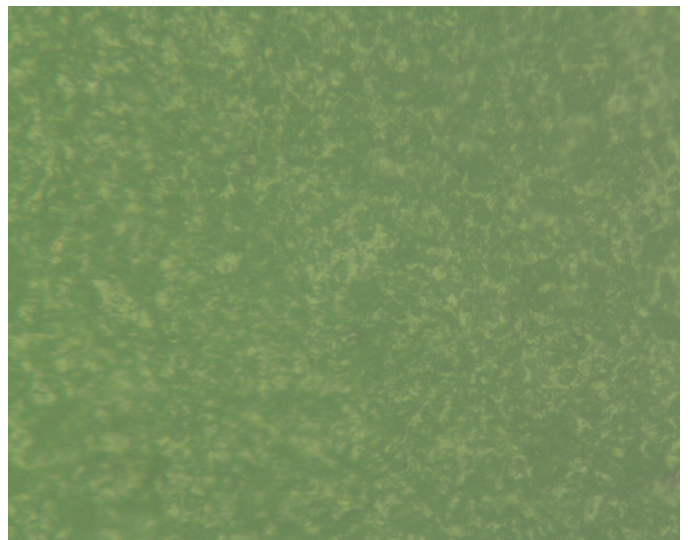
Typical weight loss on FR-4 epoxy = 0.15 to 0.25 mg/cm²

Average weight loss on Bullseye™ full desmear = 1.56 mg/cm²

Average weight loss on Bullseye™ without sweller step = 1.51 mg/cm²



Bullseye™ resin after full desmear.
200x



Bullseye™ resin after desmear without sweller step.
200x

Conclusion:

The Bullseye™ resin which is key to its function in the drill room, is easily removed by standard desmear chemistries. Both surface photos and weight loss show significant removal. Removal happens at approximately 10x that of epoxy. In the unlikely event any is deposited in the hole wall, it will not interfere with cleaning and desmear of the board resin.

Please contact the Focus Tech group if you have any questions.

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