



Materials For Harsh Environments

Laser Markable Label Materials

## Polyonics R&D Test Report: Aerospace Harsh Environment Laser Markable Label Test Results

**Objective:** Test the Polyonics family of laser markable label (LML) materials to the chemicals typically found in aerospace manufacturing processes and in the operational life of aerospace products, components, etc.

**Background:** Polyonics has developed a family of black and white LML polyimide materials with high temperature pressure sensitive adhesives (PSA) that provide high adhesive strengths on a variety of surfaces including low surface energy plastics. These materials are used in the aerospace industry for identifying and tracking components (avionics, heat treated parts, structures, etc.) in extreme environments where high temperatures, harsh chemicals and a high degree of abrasion are the norm. The LML materials can be ablated by low power CO<sub>2</sub>, YAG and fiber lasers and offer a more durable alternative to traditional thermal transfer printed labels (TTP) as well as a high temperature alternative to PET and acrylic LML materials.

**Test Methods:** The full series of chemical tests was performed per the Boeing 13-47J requirements document section 5.19 in accordance with tests outlined in section 8.11. Tabor abrasion tests were also performed as well as a 2500hr weatherability (UV) test. The LML materials tested including the Polyonics XF-537 and XF-670 (black) and XF-539 and XF-672 (white). In addition, (2) competitor acrylic LML materials (Brand T-30 and Brand M-47) were tested for comparison.

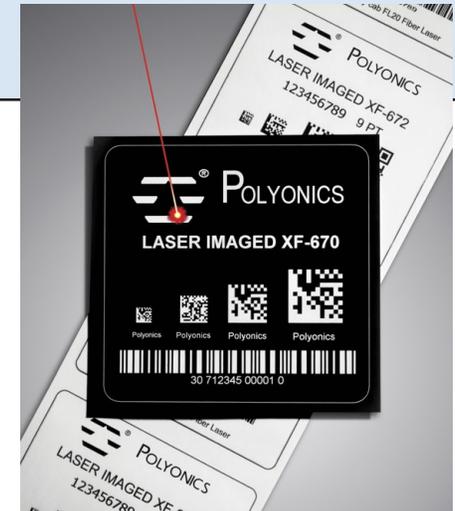
The following areas of testing were included:

- **Label Adhesion**
- **Image Durability**
- **Abrasion Resistance**
- **Chemical Resistance**
- **Weatherability**

**Results:** All four Polyonics LML materials successfully passed all chemical tests compared to failures by the competitors' products in (4) of the (10) chemical tests. All Polyonics LML materials also passed the Tabor abrasion tests and the 2500hr weatherability test.

The full results can be found on the attached chart.

**Conclusions:** Polyonics LML materials provide equal and, in many cases, far superior performance as compared to competitive LML products for use in aerospace applications involving long term exposure to high temperatures, harsh chemicals and substantial abrasion.



# Polyonics Laser Markable Label Material Test Report

Boeing 13-47J Aerospace Chemicals/GMW 14573 AbrasionTest Report

## LML Materials

Test	Conditions	XF-670		XF-672		XF-537		XF-539		XF-684		Brand T-30		Brand M-47	
		Top Coat	PSA	Top Coat	PSA	Top Coat	PSA	Top Coat	PSA						
#1 Royco 756 (Aviation Test Fluid)	24hrs @70C	5	5	5	5	5	5	5	5	5	5	5	5	5	5
#2 Skydrol LD-4 (Hydraulic Fluid B)	24hrs @70C	5	5	5	5	5	5	5	5	5	5	4	4	4	2
#3 Jet Fuel	24hrs @23C	5	5	5	5	5	5	5	5	5	5	5	5	5	5
#4 Royco 500 Lubrication	24hrs @70C	5	5	5	5	5	5	5	5	5	5	5	5	5	5
#5 Ethylene Glycol	24hrs @23C	5	5	5	5	5	5	5	5	5	5	5	5	5	5
#6 Royco 808 Turbine Oil	24hrs @70C	5	5	5	5	5	5	5	5	5	5	5	5	5	5
#7 Propylene Glycol	24hrs @23C	5	5	5	5	5	5	5	5	5	5	5	5	5	5
#8 Methyl Propyl Keytone	24hrs @23C	5	5	5	5	5	5	5	5	5	5	1	4	1	
#9 Isopropyl Alcohol	24hrs @23C	5	5	5	5	5	5	5	5	5	5	1	4	2	
#10 Salt Water 5% by Volume	24hrs @23C	5	5	5	5	5	5	5	5	5	5	4	4	4	4
#11 Tabor Abrasion (GMW3208)	100 cycles	5		5		5		5		5		5		5	
#12 Tabor Abrasion (GMW 3208)	300 cycles	5		5		5		5		5 <sup>1</sup>		5		5	
#13 QUV Weatherometer (UV-A)	2500hrs @70°C	5	5	5	5	5	5	5	5	5	5	5	5	5	5

<sup>1</sup> >500 cycles

Rating Scale	1	2	3	4	5
Top Coat	Complete Failure	Severe Discoloration	Moderate Discoloration	Slight Discoloration	No Change
PSA	Complete Removal	Moderate Release of Adhesive	Some Adhesive Release	Slight Edge Lift	No Change

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