



Outgassing

One concern some users of adhesives and coatings have is outgassing. Under conditions of heat, vacuum, or both, a plastic material can exhibit loss in weight due to gaseous emission. Outgassing data is often a requirement before electronic, aerospace and defense, space, or optical companies will consider a new adhesive.

Severe outgassing could be a concern for any or all of the following reasons:

- Outgassing could be indicative of decomposition or a change in the structure of a substrate, coating, or adhesive.
- Vapor deposition on a surface which must remain clean to retain its electrical properties.
- Vapor depositions could conceivably indicate potential corrosion, plastics crazing, or other surface weakening mechanisms.
- Contamination of the environment the part is used in.

One widely accepted outgassing standard is ASTM E595. This testing is run at 125°C (257°F) under a 5×10^{-5} Torr vacuum for 24 hours. The total weight loss (TML) and condensable volatile material (CVCM) are measured.

CVCM is of particular interest to avionics or optoelectronic applications. It might be indicative that optical parts could become fogged, electrical continuity lost, or some other effect caused by material being deposited where it is not intended.

The below products have been tested to the ASTM E595 standard and meet the TML and CVCM thresholds historically used as screening for spacecraft materials:

Adhesive Tested	Product Type	Total Weight Loss* (TML), %	Volatile Condensable Material (CVCM), %
9801	Low Shrinkage Active Alignment Epoxy	0.57	< 0.01
9802	Low Shrinkage Active Alignment Epoxy	0.36	0.01
9803	Low Shrinkage Active Alignment Epoxy	0.48	< 0.01
9771	Light + Moisture Conformal Coating	0.90	0.02
Screening Level		1.00 maximum	0.10 maximum

* Estimated to be primarily entrapped air or moisture.

In some applications, meeting the spacecraft thresholds may not be a requirement but low TML and CVCM are still needed or preferred. Please see additional products tested below that are often used in electronic, aerospace, or optical applications:

Adhesive Tested	Product Type	Total Weight Loss* (TML), %	Volatile Condensable Material (CVCM), %
181-M	Medical Grade Polycarbonate Adhesive	2.92	0.03
186-M	Medical Grade Adhesive and Coating	4.69	0.02
3069	Flexible Laminating and Bonding Adhesive	4.21	0.01
3094-T-REV-A	Low Stress Plastic Adhesive	4.90	0.24
3099	Acrylic Bonding Adhesive	2.53	0.04
6-621-VT	Multi-Cure Dissimilar Substrate Adhesive	3.45	<0.01
6-621-VT-RF	Multi-Cure Dissimilar Substrate Adhesive	3.48	<0.01
6-630	Multi-Cure Dissimilar Substrate Adhesive	4.18	0.08
729	Plating and Harsh-Chemical Maskant	3.36	0.03
7501-T-UR-SC	LED-Curable Dissimilar Substrate Sealant	3.74	0.15
9451	True Black Multi-Cure Conformal Coating	2.36	<0.01
9482	Light + Moisture Conformal Coating	3.15	0.54
9483	Light + Moisture Conformal Coating	2.02	0.13
984-LVF **	Multi-Cure Conformal Coating	5.55	0.04
984-LVF ***	Multi-Cure Conformal Coating	4.75	0.03
OP-24-REV-B	Multi-Cure Dissimilar Substrate Adhesive	2.12	0.02
OP-60	Low Shrinkage Optical Positioning Adhesive	1.87	0.09
OP-61-LS	Low Shrinkage Optical Positioning Adhesive	3.34	0.03
OP-67-LS	Low Shrinkage Optical Positioning Adhesive	1.92	0.10

* Estimated to be primarily entrapped air or moisture.

** Reference: Hughes Aircraft Corp., UV-curable conformal coating material evaluation; J. Lum, 1992.

*** Testing done following post bake of 160°F for four hours.

www.dymax.com

Americas

USA | +1.860.482.1010 | info@dymax.com

Europe

Germany | +49 611.962.7900 | info_de@dymax.com
Ireland | +353 21.237.3016 | info_ie@dymax.com

Asia

Singapore | +65.67522887 | info_ap@dymax.com
Shanghai | +86.21.37285759 | dymaxasia@dymax.com
Shenzhen | +86.755.83485759 | dymaxasia@dymax.com
Hong Kong | +852.2460.7038 | dymaxasia@dymax.com
Korea | +82.31.608.3434 | info_kr@dymax.com

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