

Low Outgassing Characteristics of Rogers Laminates Approved for Spacecraft Applications

RT/duroid® composites of PTFE with inorganic fiber filler and TMM® temperature stable hydrocarbon composites, have outstanding resistance to outgassing, according to data compiled by NASA test procedure SP-R-0022A. Reinforced PTFE laminates and PTFE composites are thermally stable and have universal outgassing characteristics. Similarly, TMM temperature stable laminates are highly crosslinked hydrocarbons which do not evolve gases or by-products at elevated temperatures. Test data shown in the table (back page) were obtained on specimens etched free of copper foil.

The test procedure² consists of vacuum heating 100 to 300 mg specimens in a copper enclosure, with exit port at 125°C for 24 hours with a chrome-plated collector maintained at 25°C located 12.7 mm from the exit port. The Total Mass Loss (TML), Collected Volatile Condensable Materials (CVCM) and Water Vapor Recovered (WVR) are expressed as a % of the original specimen mass. In general, materials exhibiting a TML of less than 1.0% and CVCM less than 0.1% are considered "low outgassing" and suitable for space applications. Note that all Rogers laminate materials listed meet these requirements.

References:

1. William A. Campbell, Jr. and Richard S. Marriott of Goddard Space Flight Center, Greenbelt, MD, "OUTGASSING DATA FOR SPACECRAFT MATERIALS", NASA Reference Publication 1124, August 1987.

Note: The database of RP1124 is updated weekly and may be accessed or downloaded from the NASA website at <http://epims.gsfc.nasa.gov/>.

2. ANSI/ASTM E595-84 "Standard Test Method for Total Mass Loss and Collected Volatile Condensable Materials from Outgassing in a Vacuum Environment", American Society for Testing and Materials, Annual Book of Standards.

NASA Outgassing Results 125°C, ≤10 ⁻⁶ torr			
Product	"Total Mass Loss %"	"Collected Volatiles %"	"Water Vapor Recovered %"
AD350A™	0.02	0.00	0.02
CLTE™	0.02	0.00	0.00
CLTE-AT™	0.04	0.00	0.00
CLTE-MW™	0.02	0.00	0.01
CLTE-XT™	0.02	0.00	0.01
COOLSPAN®	0.22	0.02	0.05
CuClad® 217	0.01	0.01	0.00
CuClad 233	0.01	0.01	0.00
CuClad 250	0.01	0.00	0.00
CuClad 6250	0.32	0.05	0.00
CuClad 6700	0.13	0.01	0.02
DiClad® 880	0.02	0.00	0.01
DiClad 870	0.01	0.01	0.01
DiClad 527	0.02	0.00	0.01
IM™-880	0.01	0.01	
IM-870	0.01	0.01	
IM-300	0.01	0.01	
IsoClad® 917	0.02	0.00	0.02
IsoClad 933	0.03	0.00	0.02
MAGTREX®	0.02	0.02	0.02
RO3003™	0.10	<0.01	<0.01
RO3006™	0.02	0.03	0.01

NASA Outgassing Results 125°C, ≤10 ⁻⁶ torr			
Product	"Total Mass Loss %"	"Collected Volatiles %"	"Water Vapor Recovered %"
RO3010™	<0.01	<0.01	<0.01
RO3210™	0.00	0.01	0.01
RO4003C™	0.06	0.00	0.02
RO4350B™	0.12	0.02	0.02
RO4360G2™	0.16	0.01	0.03
RO4450F™	0.37	0.05	0.02
RO4450T™	0.21	0.01	0.03
RO4460G2™	0.29	<0.01	0.04
RO4730G3™	0.12	<0.01	0.05
RO4835™	0.02	<0.01	0.04
RT/duroid® 5870	0.02	<0.01	0.01
RT/duroid 5880	0.01	<0.01	0.02
RT/duroid 5880LZ	0.01	0.01	0.02
RT/duroid 6002	0.03	<0.01	<0.01
RT/duroid 6006	0.01	<0.01	<0.01
RT/duroid 6010.2LM	0.02	<0.01	<0.01
RT/duroid 6202	0.02	<0.01	<0.01
RT/duroid 6202PR	0.02	0.01	0.02
RT/duroid 6035HTC	0.01	<0.01	<0.01
SpeedWave® Pre-preg	0.08	0.01	0.10
TMM®3	0.11	0.00	0.02
TMM4	0.07	0.00	0.02
TMM10	0.07	0.00	0.03
TMM10i	0.04	0.00	0.01

Note: Reporting the WVR (water vapor recovered) value is optional according to https://outgassing.nasa.gov/og_desc.html

The information in this data sheet is intended to assist you in designing with Rogers' laminates. It is not intended to and does not create any warranties express or implied, including any warranty of merchantability or fitness for a particular application. The user should determine the suitability of Rogers' laminates for each application.

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