ROGERS CORPORATION

Properties

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 procedure[2] 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/og/.

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.*

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NASA Outgassing Results 125°C, ≤10-6 torr			
Product	"Total Mass Loss %"	"Collected Volatiles %"	"Water Vapor Recovered %"
AD1000™	0.01	0	0.00
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
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	0.04	0.00	0.03
TMM 4	0.07	0.00	0.02
TMM 10	0.06	0.00	0.04

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

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