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Date In: November 10, 2020

Customer:

Ventec USA LLC
720 Lee Street
Elk Grove Village, IL 60007

Purchase Order Number: 893030

A. TEST OBJECTIVE:

Determine Total Mass Loss (TML) and Collected Volatile Condensable Materials (CVCM) from Outgassing

B. TEST ITEM(S):

Composite

C. SPECIFICATIONS / METHODS / TECHNIQUES:

1. ASTM E595-15, Standard Test Method for Total Mass Loss and Collected Volatile Condensable Materials from Outgassing in a Vacuum Environment

D. RESULTS:

The submitted material met historical screening levels for spacecraft materials as specified in ASTM E595. See Summary of Results on Page 3 for further information.

TESTING PERFORMED BY:

A handwritten signature in black ink, appearing to read "Shakilur Rahman".

Shakilur Rahman
Engineer II

TECHNICAL/QUALITY APPROVALS:

A handwritten signature in blue ink, appearing to read "Daniel D. Phillips".

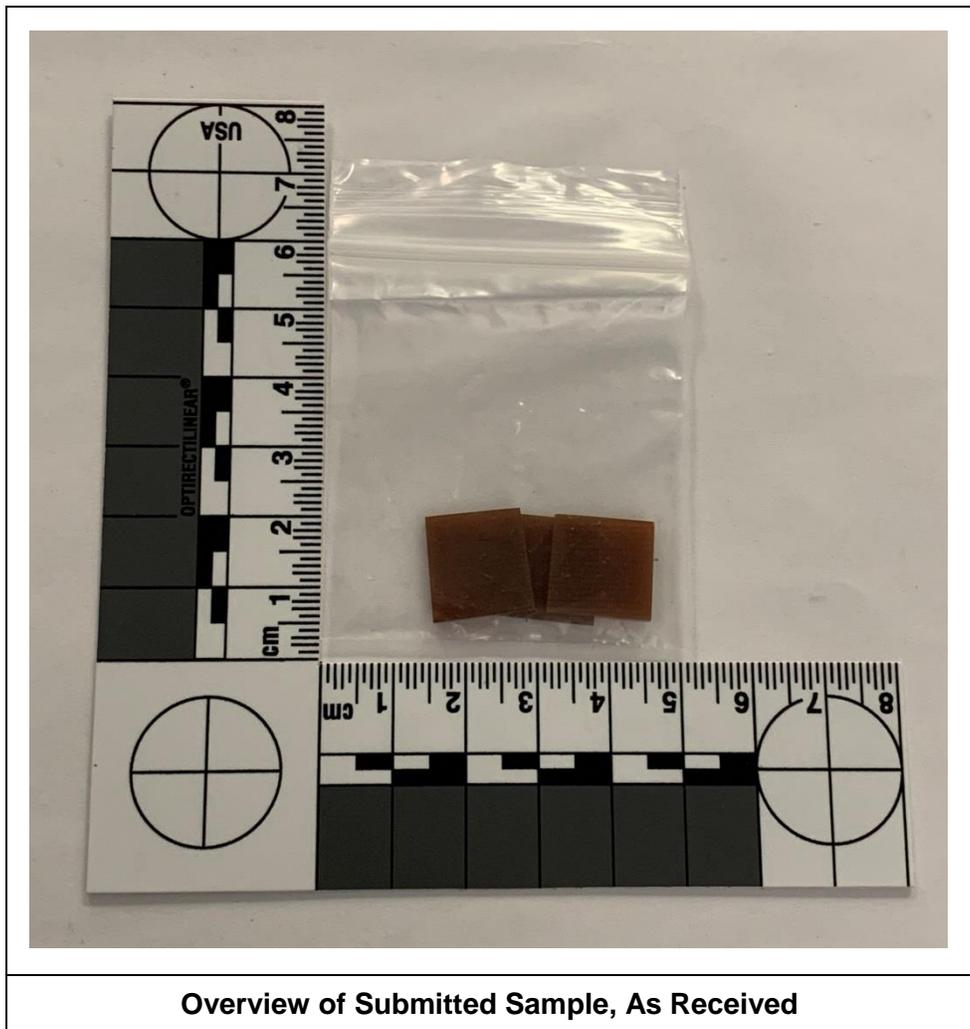
Daniel D. Phillips
Department Manager –
FA/Analytical

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TEST ITEM IDENTIFICATION

SAMPLE TYPE	Composite
NUMBER OF SAMPLES SUBMITTED	One (1)
SAMPLE IDENTIFICATION	VT901 (produced at Taiwan Plant)
SAMPLE DISPOSITION	To be disposed unless otherwise directed

The image below summarizes the sample submission:



OUTGASSING & TOTAL MASS LOSS

REFERENCE	ASTM E595-15
TEST SPECIMENS	One (1)
REQUIREMENT	ASTM E595-15, paragraph 1.5: The criteria used for the acceptance and rejection of materials shall be determined by the user and based upon specific component and system requirements. Historically, a total mass loss (TML) of 1.00% and collected volatile condensable material (CVCM) of 0.10% have been used as screening levels for rejection of spacecraft materials.
SUMMARY	The submitted material met the historical screening levels outlined in ASTM E595.
SAMPLE PREPARATION DETAILS	Random areas of each material were cut into three (3) replicates. The replicates were placed in a preformed, degreased container (boat) that had been previously cleaned and weighed. The boat and specimens were conditioned at 23°C and 50% relative humidity for at least twenty-four (24) hours and then weighed prior to placing into the specimen compartment in the test apparatus.
SAMPLE PREPARATION PERFORMED BY	SR
PREPARATION DATE	December 18-21, 2020
TEST MODIFICATIONS	N/A
TEST CONDITIONS	See datasheet
TEST PERFORMED BY	SR
TEST DATE	December 21-23, 2020
EQUIPMENT USED	WC051647, WC051695, WC051879, WC051898, WC051899, WC051903, WC059381

RESULTS:

The following table summarizes the test results.

Values listed in **RED** exceeded the requirements listed above.

PARAMETER	SCREENING LEVEL ¹ (%)	RESULT (%)
Total Mass Loss (% TML)	1.00 maximum	0.34
Collected Volatile Condensable Material (% CVCM)	0.10 maximum	<0.01
Water Vapor Recovered (% WVR)	Report	0.13

¹ Historically used as screening for spacecraft materials.

DATASHEET:

 Form 02
 Revision 3
 Page 1 of 1

ASTM E595 - TML/CVCM/WVR FROM OUTGASSING

 NTS Project: PR130127 Start Date: 12/18/2020
 Customer: Ventec USA End Date: 12/23/2020

 Average TML, % 0.34 Analyst(s): SR
 Average CVCM, % <0.01
 Average WVR, % 0.13 Sample ID: VT901
BLANKS

Heater Position	<u>1-4</u>	Holder Mass Difference, µg
Initial holder mass, g	<u>0.057527</u>	<u>-6</u>
Final holder mass, g	<u>0.057521</u>	
Initial collector mass, g	<u>4.464149</u>	Collector Mass Difference, µg
Final collector mass, g	<u>4.464145</u>	<u>-4</u>

SAMPLES

	Replicate 1	Replicate 2	Replicate 3
Heater Position	<u>1-1</u>	<u>1-2</u>	<u>1-3</u>
Initial holder mass, g	<u>0.058009</u>	<u>0.054715</u>	<u>0.051322</u>
Initial holder + sample, g	<u>0.292805</u>	<u>0.272793</u>	<u>0.274603</u>
Final holder + sample, g	<u>0.291978</u>	<u>0.272074</u>	<u>0.273879</u>
Reweight 24h/50%RH, g	<u>0.292313</u>	<u>0.272322</u>	<u>0.274157</u>
Initial collector mass, g	<u>4.495193</u>	<u>4.500856</u>	<u>4.515440</u>
Final collector mass, g	<u>4.495218</u>	<u>4.500856</u>	<u>4.515440</u>
Initial sample mass, g	<u>0.234796</u>	<u>0.218078</u>	<u>0.223281</u>
Final sample mass, g	<u>0.233969</u>	<u>0.217359</u>	<u>0.222557</u>
WVR reweighed mass, g	<u>0.234304</u>	<u>0.217607</u>	<u>0.222835</u>
TML, %	<u>0.35</u>	<u>0.33</u>	<u>0.32</u>
CVCM, %	<u>0.01</u>	<u>0.00</u>	<u>0.00</u>
WVR, %	<u>0.14</u>	<u>0.11</u>	<u>0.12</u>

 Sample Temperature, °C 125
 Collector Temperature, °C 25
 Pressure, torr 2.00E-05
 Time at Test, hr 24
Equipment Used

WC051695	WC051903
WC051879	WC059381
WC051898	WC051647
WC051899	

COMMENTS

Homogenous sample. No substance observed on CVCM disks post exposure.



EQUIPMENT LIST

Asset Number	Manufacturer	Description	M/N	S/N	Last Calibration	Cal Due
WC051647	Tabai Espec	Temp. Chamber	SH-241	92003282	07/06/2020	07/31/2021
WC051695	Blue M	Mechanical Convection Oven	ESP-400A-9	ESP-3376	07/06/2020	07/31/2021
WC051879	Mettler Toledo	MICRO BALANCE	XPE26	B812566866	08/28/2020	08/31/2021
WC051898	Agilent Technologies	Turbo-Pump Controller	X3508-64001	IT1818C262	N/A	N/A
WC051899	Agilent Technologies	Inverted Magnetron Pirani Gauge	FRG700KF25	LI1832F012	06/02/2020	06/30/2021
WC051903	Omega Engineering	6-Channel Handheld Temp Data Logger	RDXL6SD-USDB	0102-01273	03/16/2020	03/31/2021
WC059381	Extech Instruments	Type K Thermometer	421501	65000277	07/06/2020	07/31/2021

TEST METHOD**OUTGASSING & TOTAL MASS LOSS**

After conditioning, the boat and the specimen were weighed and placed in the specimen compartment in a copper heating-bar that is part of the test apparatus. The copper heating-bar was then placed in the vacuum chamber, which was then sealed.

The vacuum chamber was evacuated to a vacuum of at least 5.0×10^{-5} torr. The heating-bar was raised to a temperature of 125°C. This caused the vapor from the heated specimen to stream from the hole in the specimen compartment. The vapor passed through the collector chamber where the vapor condensed on a previously-weighed and independently temperature-controlled, chromium-plated collector plate that was maintained at 25°C.

After 24 hours, the test apparatus was cooled and the vacuum chamber was then re-pressurized with a dry, inert gas. The specimen and the collector plates were weighed. The TML and CVCM percentages were then determined.

After the specimen was weighed to determine the TML, the WVR was determined by conditioning the specimen at 23°C with 50% relative humidity for 24 hours. The specimen was again weighed and the percent WVR was calculated.



REVISION HISTORY

Rev.	Revision Date	Description
0	28-Dec-2020	Initial release



END OF REPORT