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TEST REPORT/ TEST RESULT

Standard outgassing screening: Z-PEEK

Task number OT0005408

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DISTRIBUTION

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(*) To be further distributed by J. Geary

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1. INTRODUCTION

This document is the test report of the standard outgassing test for the Z-PEEK filament performed in accordance with AD1 (based on RD1). The test was conducted in the µVCM facility (Figure 1) of the TEC-QEE laboratory at ESA/ESTEC, Noordwijk, Netherlands.

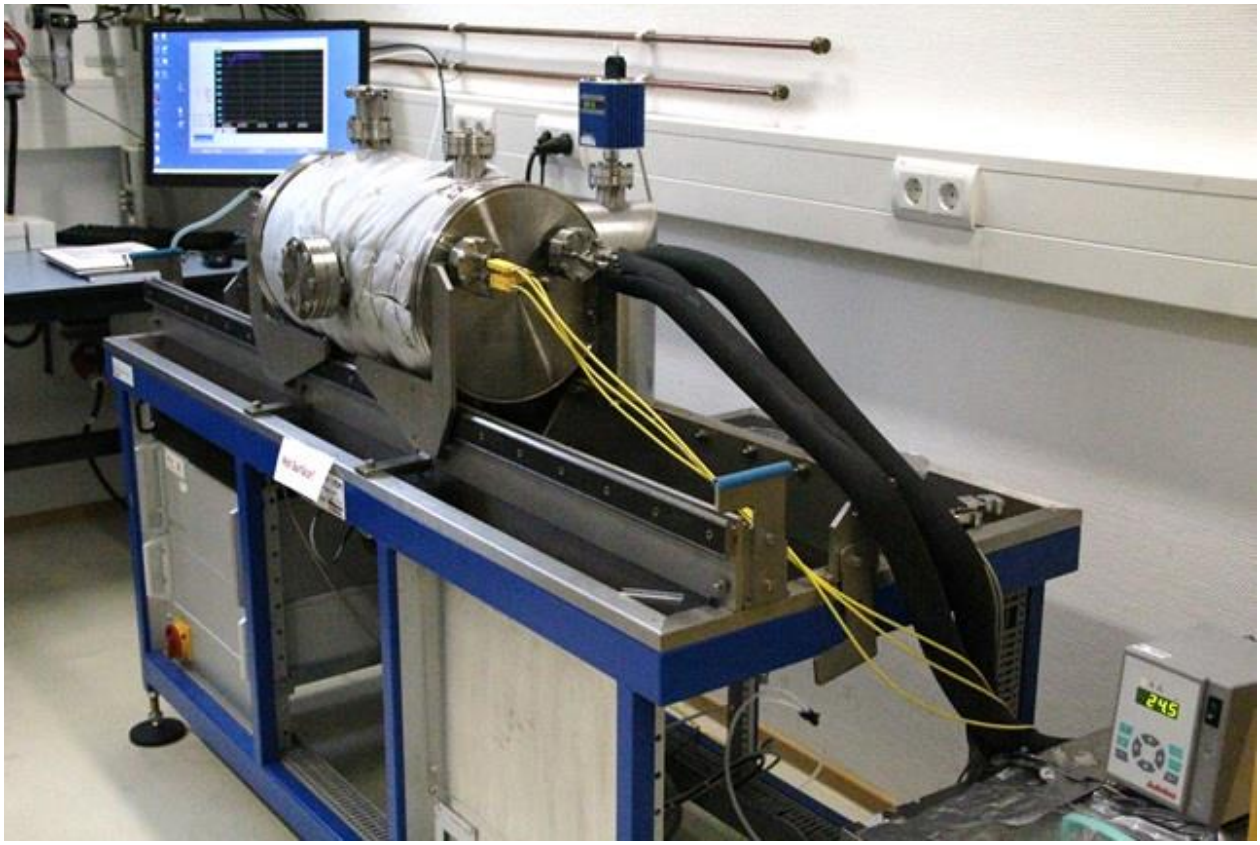

Figure 1. µVCM facility at ESTEC.

2. DISCLAIMER (RD1)

Results from the nominal screening test can be used for the screening of materials that have an operational temperature below 50 °C, especially if they are exposed for an extended period of time (in the order of weeks and above). The following points are to be taken into account:

a. For those materials that are subjected to temperature above 125 °C for short period of time (in the order of hours) or above 50 °C for an extended period of time (in the order of weeks or above), dedicated tests shall be performed at conditions representative of the real application.

b. Limits for elevated temperature testing shall be specified case by case.

c. The measurement of contamination potential shall be only used in a comparative way and is strictly valid only for collectors at 25 °C with similar sticking coefficients.

d. The data obtained from this test shall not be used for contamination predictions.

e. Modelling of the outgassing phenomenon shall be based on dynamic test results only and not on screening results obtained from the ECSS-Q-ST-70-02C standard.

3. DOCUMENTS AND ABBREVIATIONS

3.1. Applicable Documents

AD1	ESA-TEC-PR-002015	Procedure for Thermal Outgassing Tests for the Screening of Space Materials at ESTEC
AD2	ESA-TECQTE-LAB-PR-002118	ECSS-Q-ST-70-05C indirect MOC measurement procedure

3.2. Reference Documents

RD1	ECSS-Q-ST-70-02C	Thermal vacuum outgassing test for the screening of space materials
RD2	ECSS-Q-ST-70-05-C	Detection of organic contamination of surfaces by infrared spectroscopy

3.3. Abbreviations

µVCM	Micro Volatile Condensable Measurement
CVCM	Collected Volatile Condensable Material
ESA	European Space Agency
ESTEC	European Space Research and Technology Centre
MIC	Material Identification Card
RML	Recovery Mass Loss

SD	Standard Deviation
TEC-QEE	Materials' Physics & Chemistry Section, Technical Reliability and Quality Division
TML	Total Mass Loss
WVR	Water Vapour Recovery

4. SAMPLE DESCRIPTION

Samples were labelled for internal reference as 1190/VCMe862/OT0005408. Further information on the material provided by the customer can be found in Annex A.

5. TEST CONDITIONS

The µVCM vacuum chamber is located in the outgassing lab Ek007a where the environmental conditions are controlled by ESTEC site service at 22 ± 3 °C and 55 ± 10 % RH.

The sample has been tested, in accordance with AD1 (based on RD1), as per:

- Pre-test conditioning of the sample, 100-300 mg of material (unless mentioned otherwise), was 24 hours at 22 ± 3 °C and 55 ± 10 % RH.
- During the test for 24 hrs:
  - The sample was subjected to a temperature of 125 ºC.
  - The condensable material was collected by a collector plates kept at 25 ºC.
  - The test vacuum pressure was kept below 10^{-5} mbar.
- Post-test conditioning of the sample was 24 hours at 22 ± 3 °C and 55 ± 10 % RH.

6. TEST RESULTS

6.1. Outgassing Test Results

The results of the sample specimen mass measurements, before and after the test, are given in Table 1.

Table 1. Sample mass measurements using external balance

		TML (%)	CVCM (%)	RML (%)
Z-PEEK filament		0.307	0.00	0.143
		0.307	0.00	0.142
		0.310	0.00	0.145
	Average	**0.31**	**0.00**	**0.14**
	SD	**0.00**	**0.00**	**0.00**
	Uncertainties k=2	0.03	0.02	0.03

Notes:

All uncertainties are representative of typical conditions. The uncertainties represent a coverage factor k = 2, corresponding to a 95 % confidence level. All measurements performed in the process of obtaining the results presented here are traceable.

6.1.1. FTIR of the CVCM in accordance with AD2 (based in RD2)

FTIR analysis was not performed because not enough CVCM were found on the collector plates.

ANNEX A. Material Identification Card (MIC) provided by the customer.

Description and history of sample **a. Trade name + number** **b. Manufacturer** **c. Type of product** **d. Chemical nature** **e. Processing details:** **e.g. - joining method** **- heat treatment** **- cure and postcure** **- cleaning method** **- relevant spec. no**	a. Z-PEEK		b. Zortrax (Poland)
	c. Filament 1.75 mm diameter for 3D printing		d. PEEK (PolyEtherEtherKetone)
	e. Blend of different type of PEEK processed by extrusion to manufacture filament suitable for 3D printing		
Application			
Batch number **Sample quantity** **Preparation date** **Prepared by**		**Material density** **Substrate density** **Substrate material**	1.30 g/cm3
Experimenter	Mircea Helici	**Project/Cost code**	WisaWoodSat (Finish CubeSat)
		Initiator	Ugo Lafont
Test specification number		**Quality control/Evaluation sample**	Evaluation