

A Joint Conference on Materials in the Space Environment (ISMSE 15 & ICPMSE 13 2022)

IOP Conference Series: Materials Science and Engineering
Volume 1287

Leiden, Netherlands
18-23 September 2022

Editors:

**Malgorzata Holynska
Adrian Tighe
Elisabeth Laurent**

**Jacob Kleiman
Sophie Duzellier
Timothy Minton**

ISBN: 978-1-7138-7727-1
ISSN: 1757-8981

Printed from e-media with permission by:

Curran Associates, Inc.
57 Morehouse Lane
Red Hook, NY 12571



Some format issues inherent in the e-media version may also appear in this print version.

This work is licensed under a Creative Commons Attribution 3.0 International Licence.
Licence details: <http://creativecommons.org/licenses/by/3.0/>.

No changes have been made to the content of these proceedings. There may be changes to pagination and minor adjustments for aesthetics.

Printed with permission by Curran Associates, Inc. (2023)

For permission requests, please contact the Institute of Physics
at the address below.

Institute of Physics
Dirac House, Temple Back
Bristol BS1 6BE UK

Phone: 44 1 17 929 7481
Fax: 44 1 17 920 0979

techtracking@iop.org

Additional copies of this publication are available from:

Curran Associates, Inc.
57 Morehouse Lane
Red Hook, NY 12571 USA
Phone: 845-758-0400
Fax: 845-758-2633
Email: curran@proceedings.com
Web: www.proceedings.com

TABLE OF CONTENTS

Preface	
Peer Review Statement	
Compliant Mechanisms for Dust Mitigation in Lunar Hardware Development: Technology and Material Considerations.....	1
<i>D H Budzyn, H Zare-Behtash, A Cowley, A Cammarano</i>	
A Predictive Model of Lunar Gateway Molecular Outgassing and Plume-Induced Contamination	10
<i>W A Hoey, M G Martin, C A Steagall, C E Soares, G S Shallcross, E S Worthy</i>	
Metamaterial-Based Smart and Flexible Optical Solar Reflectors	22
<i>M Gaspari, S Mengali, M Simeoni, A Urbani, O L Muskens, K Sun, I Zeimpekis, C H de Groot, A Bialy, I Czolkos, L Kildebro, B Alpat, G Bartolini, M Jamalipour, J Frolec, T Kralik, F Tessarin, M Gottero, T Schillaci</i>	
Contamination Assessment of a Freely Expanding Green Propellant Thruster Plume	30
<i>L J Buntrock, M Grabe, H Fischer</i>	
Evaluation of the Material Properties of Solid Rocket Motor Slag.....	38
<i>Yoshiki Matsuura, Kumi Nitta, Hirohide Ikeda, Masahiro Kinoshita, Kyohichi Ui</i>	
Annealing Effects on Al/Polyimide Adhesion in Flexible Optical Solar Reflectors.....	46
<i>MJ Cordill, P Kreiml, A Lassnig, DD Gebhart, S Zak, C Mitterer, T Griesser, G Milassin</i>	
Assessing the Effects of Critical Parameters in Standoff Bonding.....	54
<i>O Batzilis, S Rodriguez, N Blasakis, A Baltopoulos, P Janik, A Stimoniaris</i>	
Space Silicone Adhesive Monitoring Via Minimally Intrusive Optical Fibre Sensing During Vacuum UV/VUV Radiation Exposure	63
<i>L Fazzi, N Dias, M Holynska, R Rampini, R M Groves</i>	
Solar Absorptivity Degradation of Spacecraft Materials Due to UV and Charged Particles in the Gateway Environment.....	71
<i>A Zinecker, B Spivey, G Jayne, M Hasegawa</i>	
Interaction Mechanisms Between Atomic Oxygen and Materials: Investigation on Reflected Beam.....	77
<i>D Leveque, S Duzellier, M Vilaranda Fernandes, G Chanteperdrix, D Nguyen Van Sang, V Perrin-Bailly, P Jouanne, E Laurent</i>	
Investigation of Long-Term Storage of Space Materials for Future Constellation Missions: Study of Braycote® 601 EF Lubricant	91
<i>T Henry, M Holynska</i>	
High Temperature High Voltage Potting Adhesive.....	115
<i>Isabelle Liémans, Geoffroy Petiniot, Philippe Vandeplassche, Déborah Daclin, Malgorzata Holynska, Andreas Franke</i>	
Interaction Study of Energetic Protons and Electrons with the Vacuum Ultra Violet Source Used in the Complex Irradiation Facility.....	125
<i>Erik M. Klein, Patric Seefeldt, Maciej Sznajder, Thomas Renger</i>	

Coatings Made by Atomic Layer Deposition for the Protection of Materials from Atomic Oxygen in Space	135
<i>Maido Merisalu, Kaisa Aab, Väino Sammelselg, Kaupo Kukli, Harry Alles, Ivan Netšipailo, Uno Mäeorg, Johanna Wessing, Agnieszka Suliga, Adrian Tighe, Leo Nyman, Marko Pudas, Emmi Manninen</i>	
Design of Innovative High-Performance Polymer for Passive Lunar Dust Mitigation	151
<i>Guido Saccone, Nunzia Favaloro, Claudio De Rosa, Rocco Di Girolamo, Giuseppina Di Stefano, Fabrice Cipriani</i>	
Smart Heaters Based on Flexible Electronics for Future Spacecrafts	162
<i>B Pozo, L Machón, D Cantero, I Muñoz</i>	
A Simple Method for Determining Shallow Charge Distributions in Dielectrics Via Pulsed Electroacoustic Measurements	170
<i>Zachary Gibson, J R Dennison</i>	
Euclid Cleanliness and Contamination Control.....	177
<i>Mauricio Portaluppi, Sandra Fontorbes, Antonio Saverino, Riccardo Rampini</i>	
Evaluation of Advanced Cleaning Processes for Sensitive Surfaces in Optical Instrumentation	191
<i>D Cheung, D Faye</i>	
Improvement of Bake-Out Prediction Thanks to Realistic Species Separation.....	199
<i>Jean-François Roussel, David Lansade, Delphine Faye, Guillaume Rioland, Véronique Perrin, Sylvie Brosse, David Nguyen Van Sang, Christophe Théroude, Christopher Laurent</i>	
Measurement of Mass Gain Behavior Due to Hydration and Reduction of Uncertainty Induced by Time Lag of Weighing on Pristine Kapton Film After Heating in Vacuum.....	214
<i>Eijo Fujiwara, Minoru Iwata, Masahito Tagawa, Sumitaka Tachikawa</i>	
Contamination Level Prediction: Progress in Species Separation by TGA/MS	228
<i>David Lansade, Jean-François Roussel, Delphine Faye, Guillaume Rioland, Agnieszka Suliga, Orcun Ergincan</i>	
A Cryogenic Method for Testing Thermal Radiative Properties of Surfaces for Space Probes.....	247
<i>J Frolec, T Kralik, B Bras, M Portaluppi</i>	
Thermal Absorptivity of a Metallic Surface Contaminated by EAC-1A Regolith Simulant	252
<i>T Kralik, J Frolec, B Bras, M Portaluppi</i>	
Detection and Characterization of Contamination with Fluorescence Spectroscopy	259
<i>E Gouisset, G Rioland, F Bourcier, D Faye, P Walter, F Infante</i>	
Euro Material Ageing – Ground-Based Testing and Selection of the ESA Flight Candidate Materials	280
<i>Agnieszka Suliga, Johanna Wessing, Aurélie Hand, Adrian Tighe, Sebastien Vincent-Bonnieu, Riccardo Rampini</i>	
High Temperature Atomic Oxygen Testing for ESA’s Envision Mission to Venus	288
<i>Agnieszka Suliga, Abel Brieva, Gabor Milassin, Adrian Tighe, Thomas Voirin</i>	
Euclid: Ice Contamination Testing	299
<i>S Szmolka, B Bras, M Portaluppi, K Paterson, M Schirmer, L Venancio</i>	
Study of Contaminants Generated from Space Materials by Impingement of Atomic Oxygen	315
<i>R Yamanaka, D Faye, Y Kimoto, N Maillard</i>	

Commercial Optical Coatings in Space.....	334
<i>Johanna J. Wessing, Bruno Bras, Nuno Dias, Adrian Tighe, Riccardo Rampini</i>	
Materials Inspection of the ISS Columbus Trunnion Scuff Plate MLI.....	347
<i>C Mooney, N Dias, Y Butenko, O Schmeitzky, G van Papendrecht</i>	
Analysis of Micron Size Space Debris Impacts on Materials: Comparison of Ground-Based Testing and In-Flight Results	366
<i>Kristien Peeters, Ricardo Martins, Adrian Tighe, Riccardo Rampini</i>	
Molecular Contamination Control for Exomars 2022 Mission	379
<i>A. Pandi, I. Locantore, M. Giuliani, A. Saverino</i>	
Using a Portable IR Spectrometer for Materials Characterization and Identification	390
<i>S Szmolka, B Bras, O Erginçan</i>	
Comparison Between Purged and Vacuum Bake-Out Efficiency.....	397
<i>S Szmolka, B Bras, R Rampini</i>	
Characterisation of Lunar and Martian Dust Simulants and Impacts on Thermo-Optical Properties of Space Materials	409
<i>A Suarez Kahan, B Delacourt, N Dias, M Holyńska, A Tighe</i>	
Monopropellant Plume-Induced Contamination Testing for the Europa Lander Mission Concept.....	436
<i>Martin Grabe, Leonie J Buntrock, Carlos E Soares</i>	
Modelling of Particulate Contamination Redistribution Inside Purged Cavities.....	446
<i>D Faye, F Dall'armi, P Bombardier</i>	
Space Polymers Erosion in Simulated LEO and VLEO Environments.....	460
<i>Z Iskanderova, M Tagawa, J Kleiman, S Nishioka, S Horimoto</i>	
Regolith Adherence Characterization (RAC) Experiment on the Moon and It's Ground-Based Simulation: Materials Issues.....	473
<i>Jacob Kleiman, Zelina Iskanderova, Leon Krishtein, Richard Ng, Rana Sodhi</i>	
Ariane 5 Fairing Preparations for the James Webb Space Telescope (JWST).....	496
<i>E M Stewart, E M Wooldridge, O Schmeitzky, J Bonhomme, M Madsen</i>	
International Space Station Bipropellant Plume Contamination Model Update for Short Thruster Pulse Widths	512
<i>Katie Fox, Courtney Steagall, Taria Usher, Alexandra Deal, Erica Worthy</i>	

Author Index