Job Title: Internal Research Fellow (PostDoc) Scientific Study of the mission TML (Total Mass Loss) approach

Req ID **2481** - Posted **20/09/2017**

EUROPEAN SPACE AGENCY

Research Fellowship Opportunity in the Directorate of Technology, Engineering and Quality.

ESA is an equal opportunity employer, committed to achieving diversity within the workforce and creating an inclusive working environment. Applications from women are encouraged.

Post
Internal Research Fellow (PostDoc) Scientific Study of the mission TML (Total Mass Loss) approach
This post is classified F2 on the Coordinated Organisations' salary scale.

Location
ESTEC, Noordwijk, The Netherlands

Description
The Materials' Physics & Chemistry Section is operating state-of-the-art space simulation facilities (vacuum, temperature, electromagnetic and particle radiation) as well as materials' characterisation instrumentation within the Materials and EEE components laboratory. It also provides engineering support to all ESA projects and development programmes in the area of materials' physics and chemistry, associated processes and environmental effects.

The Section's laboratory covers the physical analysis and characterisation of materials, chemical analysis and characterisation of materials, cleanliness and contamination control, environmental evaluation (ground/space effects) including laboratory testing work as well as performance prediction and verification (including in-orbit and post-flight analysis) of materials and associated processes.

Interested candidates are encouraged to visit the ESA website.

Field(s) of activities/research
The mission TML (Total Mass Loss) Approach for radiation induced contamination effects on critical spacecraft surfaces.

Today's high performance earth observation and science mission require more and more stringent requirements on critical payloads/surface w.r.t. contamination. Molecular contamination generated by outgassing materials create a local space environment around a freely flying spacecraft. Effects of this localised contamination environment or cloud around a spacecraft are enhanced by external space environmental factors, in particular by electron, proton and photon radiation causing unexpected degradation of their thermo-optical properties, transmissions of optical windows, reflectivity of mirrors, etc.

During the preparation for ESA's mission to Mercury (Bepi Colombo) radiation induced contamination effects on critical spacecraft surfaces have been studied and the novel "mission total mass loss" (TML) approach has been proposed by ESTEC **[1]**. This new approach aims to create a representative contamination environment during space environmental testing of spacecraft' critical surfaces similar to that around the spacecraft during its mission. The objective is to systematically investigate effects of the simulated space environment (contamination and radiation) on the performance of several selected critical surfaces/materials. To achieve this objective several environmental tests with materials (samples) used in space industry will be performed. Samples will be investigated by several research techniques (Spectrometers, XPS, SEM, AFM…) available at the Materials Lab to evaluate their performance. The activity aims to prepare an alternative path to understand the behaviour of materials for high performance spacecraft.

The proposed work will involve the application of the new approach of UV/VUV induced contamination testing of thermo-optical coatings (including new contamination repellent coatings being developed by industry/ESTEC for ESA space

missions). This new testing approach is based on *in-situ* measurements of reflectivity of samples in several narrow wavelength bands.
The approach allows:
(1) to perform measurements without any test interruption for sample characterisation which is common in the old testing approach;
(2) to measure directly the kinetics of the sample degradation depending on the test conditions. The scientific goal will be to study the kinetic/rates of thermo-optical coatings degradation, specifically to perform several UV/VUV induced contamination tests :

1. at fixed rate of contamination flux, temperature (typical rates, temperatures and contamination are characteristic for scientific and EOP mission) and variable UV/VUV intensities;
2. at fixed UV/VUV intensities, temperature and variable rates of contamination flux;
3. at fixed UV/VUV intensities, rate contamination flux and at different temperatures;
4. transformation of contamination adsorbed on surfaces without external contamination flux in the presence/absence of UV/VUV radiation

These series of tests are intended to examine the precise mechanism of the complex process of thermo-optical degradation induced by contamination and radiation consisting of the following main steps: contamination adsorption/desorption on surfaces – UV/VUV fixation of contamination – further surface contamination transformation into darker substances. Specifically the rate limiting process and activation energy of this process can be determined.
For more information click here.

Technical competencies

Knowledge relevant to the field of research
Research/publication record
Ability to conduct research autonomously
Breadth of exposure coming from past and/or current research/activities
Interest in space and space research
Ability to gather and share relevant information

Behavioural competencies

Innovation & Creativity
Continuous Learning
Communication
Relationship Management
Self Motivation
Problem Solving
Cross-Cultural Sensitivity

Education

Applicants should have recently completed, or be close to completion of a PhD in a related technical or scientific discipline, preferably in materials science, physics/chemistry of materials or materials engineering, or applied physics. Preference will be given to applications submitted by candidates within five years of receiving their PhD.

Additional requirements

Applicants should have good understanding of materials analysis techniques, ability to perform experimental work in laboratory. Knowledge of the space environment (vacuum, chemistry, temperature) and previous experience with vacuum technology and/or surface analysis would be a strong asset.
The working languages of the Agency are English and French. A good knowledge of one of these is required. Knowledge of another Member State language would be an asset.

Other information

For behavioural competencies expected from ESA staff in general, please refer to the ESA Competency Framework.

The Agency may require applicants to undergo selection tests.

The closing date for applications is 18 October 2017.

In addition to your CV and your motivation letter, please add your proposal of no more than 5 pages outlining your proposed research in the "additional documents" field of the "application information" section. Candidates are asked to arrange for 3 reference letters, to be sent by the referees themselves, before the closing date to temp.htr@esa.int. Please ensure your name is mentioned in the subject of the e-mail.

If you require support with your application due to a disability, please email contact.human.resources@esa.int.

Please note that applications are only considered from nationals of one of the following States: Austria, Belgium, the Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Ireland, Italy, Luxembourg, the Netherlands, Norway, Poland, Portugal, Romania, Spain, Sweden, Switzerland, the United Kingdom and Canada and Slovenia as well as Bulgaria, Cyprus, Latvia, Lithuania, Slovakia as European Cooperating States (ECS).
Priority will first be given to candidates from under-represented Member States.

In accordance with the European Space Agency's security procedures and as part of the selection process, successful candidates will be required to undergo basic screening before appointment