



Thermally Functionalised Optical Surfaces



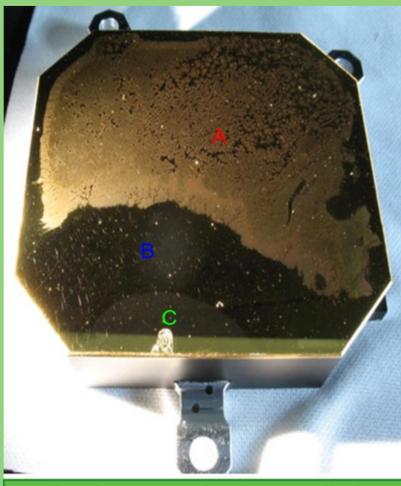
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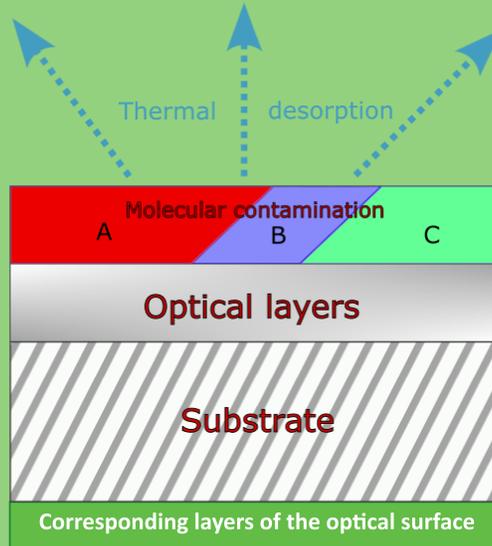


Abstract: Molecular contaminations coming from a satellite's instrument or platform could compromise space optics. In our group, we focus on finding alternative ways to circumvent this issue by using thermally functionalised optical surfaces. Indeed, a heating system could produce a thermal degassing on the optical instruments that would impede molecular contaminations. This smart surface could be placed directly under the optical device and increase the efficiency as well as the heat transfer homogeneity while reducing the power consumption. Additive manufacturing, and more precisely the LIFT technique, could be used to assemble the system.

1. Application context



Molecular contaminations. 3 distinct areas (A-B-C) are contaminated

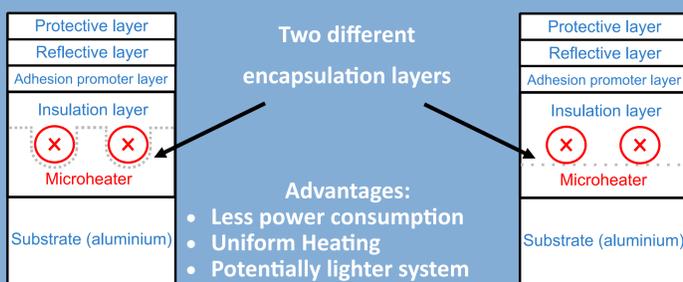


Sources of molecular contaminations

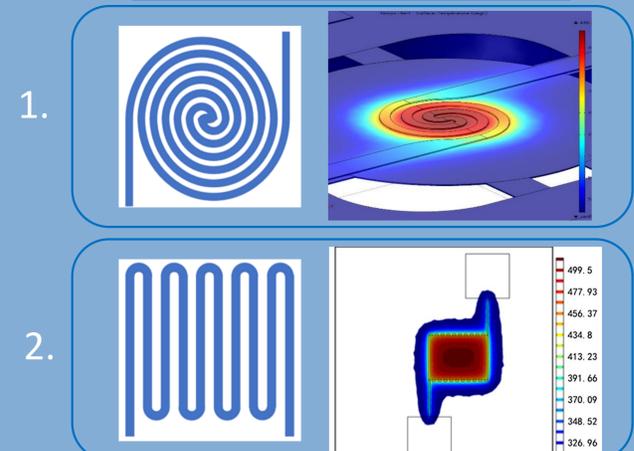
- Spacecraft structures
- Solar panels arrays
- Atmosphere
- Mirror layers
- Other systems in the enclosure
- Thermal insulator (MLI)
- Organic molecules

2. Objectives: Thermally Functionalised Optical Surface

Side view of Thermally Functionalised Optical Surface structure



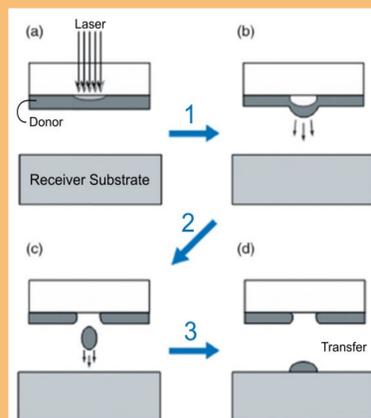
Two possible designs and their expected thermal distribution (top view)^{1,2,3}



3. Possible Method: LIFT (Laser Induced Forward Transfer)



Laser Induced Forward Transfer System



Voxel transferred from donor to receiver substrat⁴



Gold tracks obtained by LIFT technique. Tracks are encapsulated in a sol-gel

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References:

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3. Li et al. 2018; Electro-thermal analysis of an Al-Ti multilayer thin film microheater for MEMS thruster application
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