Master thesis

Wetting behaviour of the femtosecond laser textured thermal barrier coatings

The 'volcanic ash vs. jet engines' research group at the Ludwig-Maximilians-Universität München (**LMU Munich**) is currently collaborating with Laboratory for Attosecond Physics at the Max-Planck-Imstitut für Quantenoptik (**MPQ**) to offer a Masters thesis on the application of femtosecond laser irradiation to the creation of 'self-cleaning' thermal barrier coatings for applications in jet engines to resist the wetting of molten volcanic ash particles. The position offers a remarkable opportunity to be part of a multi-disciplinary group working at the forefront of geosciences, aircraft material science, ultrafast laser science in a highly international environment.

Description: The wetting behaviour of volcanic ash strongly impacts deposition in hot jet engines. In this project, the Masters student will experimentally investigate the effect of femtosecond laser irradiation process parameters (e.g. fluence and scanning speed) on the hydrophobicity of molten volcanic ash of the resulting micro/nano-patterned morphologies on different materials at high temperature (1100-1600 ^{o}C). The work will be part of a large research initiative on Volcanic Ash Deposition in Jet Engines (VADJEs) funded by the 'Freigeist' Fellowship of the Volkswagen Foundation in Germany and headed by Dr. Wenjia Song. The femtosecomd machining of the surfaces will take place PFS laboratory at MPQ (lead by Prof. Stefan Karsch and Dr. Zsuzsanna Major) and following this, the experimental investigation of the wetting behaviour of the produced surfaces will be carried out. In this second part the student will employ a range of novel experimental and analytical techniques available at Munich and elsewhere.

Tasks:

- To examine the effect of the laser pulse parameters on the generated patterns on the substrates.
- To test the effect of various patterns on the wetting behaviour of molten volcanic ash.
- To establish the correlation between the characteristic morphology and the corresponding wettability of volcanic ash and the laser operation parameters.

Required skills:

- Basic knowledge in materials science, optics, and femtosecond lasers, preferably with previous experimental experience in any of these areas.
- Ability to work in an international, interdisciplinary team.
- English language, since our research environment operates in English.

Applications should include a **CV, Bachelor transcript, and a statement explaining how your research experience and academic knowledge relate to the project in general and describing your motivation.**
Applications should be sent as a single PDF-file to: Dr. Wenjia Song wenjia.song@lmu.de, Dr. Zsuzsanna Major (Zsuzsanna.Major@mpq.mpg.de) and Prof. Donald Bruce Dingwell dingwell@lmu.de.