Research Proposal

Title: "Experimental characterization of micropatterned interfaces subjected to dynamic loading" (PhD research project)
Main Research Project: SURFACE (ERC-2021-Startting Grant, https://doi.org/10.3030/101039198)
Scholarship: ≈20 k€/year (taxes according to Italian regulations, scholarship amount may increase)
Duration: 3 years
Supervisor: Prof. Antonio Papangelo

Research topic

We are looking for a top-level mechanical engineer (and alike) who is keen to work in the field of soft contact mechanics by using experimental methods. The research proposal will be funded by the European project "SURFACE" (ERC-2021-STG), which aims at developing numerical and experimental techniques for the optimal design of micro-structured polymeric adhesive surfaces in order to regulate interfacial adhesion for grippers, manipulators and adhesive pads.

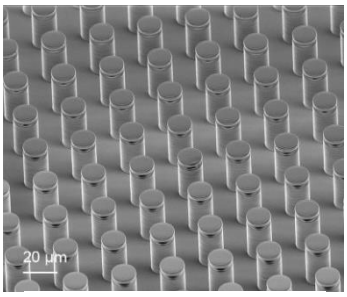

Figure 1 – Micro-structured surface for interface functionalization ©Nanoscribe

Macroscopic adhesion of micro-structured surfaces depends on geometry, at the macro and micro scales, on the choice of materials, on the control strategy used for applying the loads. Given the complexity of the problem, the researcher will be asked to design and develop **experimental methods** suitable for measuring contact forces, making indentation test, pull-off tests. The project will therefore plan to: (1) design micropatterned interfaces using CAD, (2) using high resolution 3D printing based on 2-Photon-Polymerization to fabricate the desired micro-structured interface, (3) test the adhesive capabilities of such interfaces with a dedicated test bench, (4) compare the experimental results with existing literature.


Figure 2 - TriboDynamics Lab at DMMM, PoliBa

The research topic opens to the possibility to collaborate with several internationally recognized research centers and universities: the Laboratory of Tribology and System Dynamics (LTDS) École Centrale de Lyon, with the Department of Mechanical Engineering at the Technical University of Berlin, with the Italian Institute of Technology (IIT). To the researcher will be offered the opportunity to visit a research center abroad for a research staying of maximum 12 months in order to sharpen his/her skills in the field of experimental contact mechanics. For the experimental measurements, the researcher will make use of the equipment and competences available at the TriboDynamics Lab (DMMM, PoliBa), in particular regarding the possibility of designing and fabricating polymeric micro-structured interfaces with resolution down to 200 nanometers using a 2-Photon-Polymerization microfabrication system. The TriboDynamics Lab is funded within the research project "SURFACE" ERC-2021-StG (Grant agreement ID: 101039198). The researcher will work in a stimulating and international environment in an internationally recognized Italian University such us Politecnico di Bari.

Please, apply at antonio.papangelo@poliba.it attaching your CV.