

2018 Helmholtz – OCPC – Program for the involvement of postdocs in bilateral collaboration projects

PART A

Title of the project: Developing functional patterned slippery liquid-infused interfaces for novel microfluidic applications

Helmholtz Centre and institute: Karlsruhe Institute of Technology (KIT), Institute of Toxicology and Genetics (ITG)

Project leader: Dr. Pavel Levkin

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Description of the project (max. 1 page):

Liquid-infused interfaces or slippery surfaces possessing excellent liquid repellence were recently introduced by impregnating a porous surface with a lubricant, thereby creating a stable lubricant layer on top of this surface. In contrast to air-filled repellent surfaces, such liquid-locked surfaces reveal greater robustness against pressure and hydrodynamic shear. Moreover, by chemically patterning the underlying surface material, it is possible to spatially displace the lubricant from sharply defined features by an intruding liquid. We previously demonstrated that a wide range of intruding liquids, varying in surface tension from perfluoro oils to water, can be patterned into pre-defined compartments. We used this method to create oil-in-oil tracks of mineral oil in a perfluoro-oil background and showed that water droplets follow precisely the mineral oil tracks. This allowed easy planar manipulation of water droplet movement on a 2D-track system.

The goal of this project is to develop the system further by testing a wider range of liquids for their suitability to guide entrapped water droplets. These include magnetic fluids and ionic liquids. Adequate surface functional groups to pattern these liquids will need to be identified. Furthermore, the porosity and chemical identity of the underlying polymer surface will be optimized for an adequate displacement by intruding liquid and subsequent long-term stable capture of this intruding liquid in place. The goal of the project is to establish basic droplet manipulations such as controlled merging, mixing, sorting and splitting. This will be achieved through a combination of droplet actuation and underlying guiding tracks geometries. As a part of this project, this novel microfluidic system based on the patterned slippery liquid-infused interfaces will be further investigated and developed.

Description of existing or sought Chinese collaboration partner institute (max. half page):

Required qualification of the post-doc:

- PhD in Chemistry or Chemical Engineering or Bioengineering or similar
- Experience with surface functionalization, superhydrophobicity, microfluidics, slippery interfaces
- Additional skills in microscopy, surface characterization methods, surface chemistry

PART B

Documents to be provided by the post-doc, necessary for an application to OCPC via a postdoc-station in China, which is affiliated to a research institution like a university:

- Detailed description of the interest in joining the project (motivation letter)
- Curriculum vitae, copies of degrees
- List of publications
- 2 letters of recommendation
- Proof of command of English language

PART C

Additional requirements to be fulfilled by the post-doc:

- Max. age of 35 years
- PhD degree not older than 5 years
- Very good command of the English language
- Strong ability to work independently and in a team