Molecular Tribology -
Watching individual liquid molecules moving at interfaces

Post-doctoral position: 18 months. Possibility of extension.
Start date: open until position filled

Contact: Jean COMTET**,** SIMM Laboratory - ESPCI PSL, SU, CNRS**,** Paris, France
jean.comtet@espci.fr ; https://blog.espci.fr/jcomtet

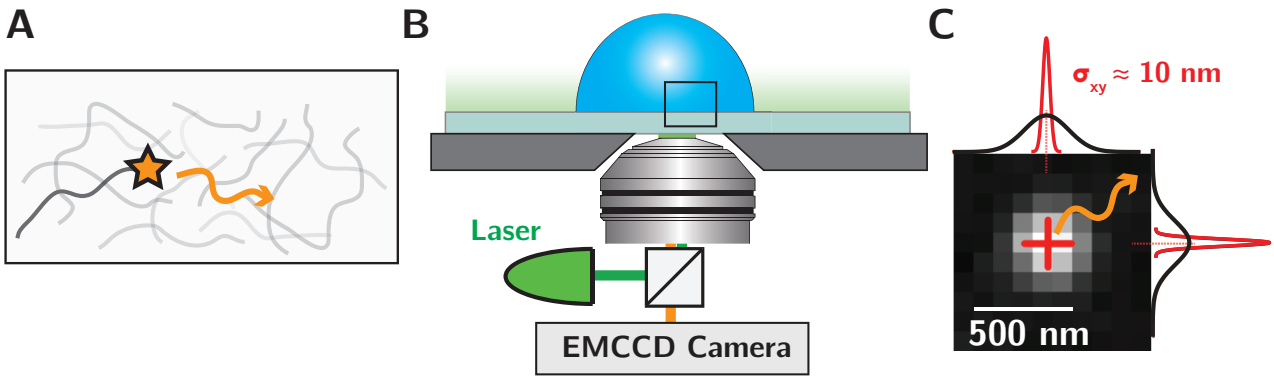

Figure. (A) *Zoom on a polymeric liquid melt, composed of dense interacting molecules, some of which tagged with a single fluorophore.* ***(B)*** *Schematic of the Single-Molecule fluorescence Microscopy set-up.* ***(C)*** *Typical fluorescent signal on the camera, with a single diffraction-limited spot related to the emitting fluorophore, localized and tracked with nanometric resolution and high temporal resolution (0.1 kHz).*

Molecular-scale interactions between liquids and solid surfaces govern a large range of processes in soft-matter, from wetting dynamics to confined flows in nanofluidic devices. These situations are typically probed at an ensemble level and described by averaged phenomenological coefficients accounting for the interfacial response, e.g. a slip length characterizing interfacial friction. However, the molecular foundations behind this ensemble vision remain unclear, due to our current inability to experimentally observe the intrinsically nanoscale molecular processes taking place at these interfaces.

We aim here to bridge this gap and develop a new molecular-based understanding of interfacial liquid dynamics, by proposing novel approaches to directly visualize molecular motion in dense polymeric liquid melts at the nanoscale. We will rely in particular on state-of-the-art single-molecule and super-resolution fluorescence microscopy techniques which can be used to localize and track the motion of individual fluorophores with nanoscale resolution and high temporal resolution. Accessing molecular liquid motion at interfaces has been so far exclusive to molecular dynamics simulations: by revealing previously invisible motion, we expect our approach to propel the development of a new molecular vision of liquid dynamics in confinement and at interfaces, with broad impact for a range of fields and materials where interfaces are key.

We are looking for a strongly motivated experimentalist, with a background in Soft Matter Physics or Optics.

[1] *Nature Nanotechnology*, *15*(7), 598-604 *(2020).* https://doi.org/10.1038/s41565-020-0695-4
[2] *Science Advances*, *7*(40), eabg8568 *(2021).* https://doi.org/10.1126/sciadv.abg8568
[3] *Nature Materials*, *22*(10), 1236-1242 *(2023).* https://doi.org/10.1038/s41563-023-01658-2