

## Single molecule nanotribology: understanding friction and adhesion at a single molecule level

(Scientific Lecture track)

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**Abstract:** *Understanding the motion of a single molecule over a surface is a problem of a paramount importance in the design of advanced molecular nanostructures. To date, the interplay between molecule mechanics and surface displacements is a highly challenging task as it requires knowing not only the forces needed to manipulate but also to relate them with particular molecular motion. Here we bridge this gap by combining MD, and force spectroscopy to investigate the manipulation of two different molecules (ssDNA and poly-pyrene) over a Au surface in UHV at 5K. Our experiments/simulations revealed a contrasting on-surface dynamics of these molecules. The high ssDNA adhesion allowed to quantify for the first time the stretching stiffness of a single DNA nucleotide. The poly-pyrene revealed a complex on-surface dynamics governed by its superlubric sliding. Overall our results unravel the importance of a dynamic balancing between the intra-molecular mechanics and surface interaction.*

**Bio:** Graduated in 2017 in Physics at the University of Coimbra (ranking best student of the promotion). In 2011 he obtained a PhD in the University of Lyon with a Portuguese fellowship awarded based on his merits. Then, he spent 7 years in Universidad Autónoma de Madrid developing methods to unravel atomic detail of Scanning Probe Microscopy Experiments. Now, he is a Marie Curie fellow (ranking top 2% in the Physics panel) in the University of Basel to unravel the molecular origins of friction at nanoscale.