

Politecnico di Milano, Department of Energy, Cesnef (Building 19), via Ponzio 34/3, Milan  
Seminar Room 1° floor

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## Atomic and molecular diffusion on solid surfaces

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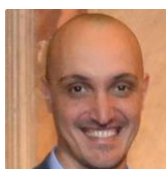
The diffusion of atomic and molecular species on solid surfaces is a ubiquitous phenomenon that drives a large variety of physical and chemical processes, spanning from the self-assembly of metallic nanosized clusters in patterned materials to heterogeneous catalysis, where adatom diffusion is relevant in cases where the reaction is mediated by spatially separated active sites. By combining Scanning Tunneling Microscopy and Density Functional Theory, I will discuss selected examples highlighting the rich phenomenology of atomic and molecular diffusion.

In the first part of the talk I will show the effects of small amounts of foreign atoms (surfactants) which, after being adsorbed on the substrate before the film deposition, influence the nucleation of the film.<sup>1</sup> Then I will show that the development of a metastable crystallographic phase can induce a layer dependent atomic diffusion, as observed in the case of ultrathin Co films grown on Fe(001).<sup>2</sup>

Finally, I will analyze the effects that a single layer of oxygen atoms adsorbed on the Fe(001) surface has on the diffusivity of fullerene molecules (C<sub>60</sub>), showing that C<sub>60</sub> follows an hybrid nucleation path, in between diffusion-mediated growth and ballistic deposition.<sup>3</sup>

### References

- [1] A. Picone *Encyclopedia of Interfacial Chemistry* 221-231 (2018)
- [2] A. Picone et al. *Phys. Rev. Lett.* **113**, 046102 (2014).
- [3] A. Picone et al. *ACS Appl. Mater. Interfaces* **8**, 26418–26424 (2016).



### About the speaker:

Andrea Picone received his doctor degree in Physics on March 2012 from Politecnico of Milano. During his Ph.D. he mostly focused on the characterization of the structural and electronic properties of transition metal oxides, by means of Scanning Tunneling Microscopy and X-ray photoemission spectroscopy. During 2011, he spent seven months at the Karl Franzens University, Graz (Austria), in the research group of Prof. Falko Netzer, where he investigated the electronic and structural properties of oxide low-dimensional model systems by means of low temperature scanning tunneling microscopy. Since 2019 he is a tenure track professor of experimental physics at the Politecnico of Milano. Currently, his main scientific interest is towards the study of layered systems formed by ultra-thin oxides and ferromagnetic metals. He is author of about 40 scientific papers on international peer-reviewed journals. He received about 20 oral contributions and 3 invited talks in international conferences.

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