

Politecnico di Milano, Department of Energy, Cesnef (Building 19), via Ponzio 34/3, Milan

Tuesday, July 20th, 2021 at 16.00 (CEST)
(in teleconference at this link: [Click here to join the meeting](#))

On-surface synthesis of 2D materials with Dirac cones and semiconducting properties

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This Talk will report about the on-surface synthesis tool, that represents an opportunity to synthesize one- and two-dimensional (1D, 2D) nanostructures. A key characteristic of this approach is the possibility to change the materials' characteristics, in particular the electronic band structure, by varying the monomer building blocks (e.g. changing constituent atoms and symmetry). On-surface synthesis permitted the synthesis of mesoscale ordered 2D π -conjugated polymers on Au(111) with semiconducting properties showing Dirac cone structures and flat bands [1], theoretically predicted [2]. Although the 2D polymers have been obtained on a metal surface, they can be transferred to other substrates to be used in devices. These results overcome the major barriers to the application of 2D π -conjugated polymers due to small domain size and high defect density. Dirac cones, present in the band structure of graphene and responsible of its remarkable charge-transport properties, are not exclusive to graphene but require that the material presents specific symmetry and delocalized electrons. Efforts have been devoted to identifying 2D materials beyond graphene that offer a non-zero band gap while retaining high carrier mobility [3].

References

[1] G. Galeotti, ..., G. Contini, *Nature Materials*, 19, 874 (2020).

[2] Y. Jing and T. Heine, *J. Am. Chem. Soc.* 141, 743 (2019).

[3] K. Asano and C. Hotta, *Phys. Rev. B* 83, 245125 (2011); J. Wang et al., *Natl Sci. Rev.* 2, 22 (2015).

About the speaker:



Giorgio Contini is Researcher and Laboratory Head of the SAMOS (Self-Assembled Materials On Surfaces) Lab at ISM-CNR and Acting Professor at the Physics Department, Tor Vergata University, Roma, Italy. He got a MSc in Physics from La Sapienza University, Roma, Italy and a PhD in Materials for Health, Environment and Energy from Tor Vergata University, Roma, Italy. Its main research activity concerns on low-dimensional organic nanostructured materials with the aim of developing molecular electronic devices and sensors.

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