

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

Monday, 25<sup>th</sup> November, 2019 – 15.30

## Plasmonic titanium nitride thin films and nanostructures for light-to-heat energy conversion

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Refractory metal nitrides have recently emerged in diverse applications; in particular, TiN has shown the potentiality of substituting traditional coinage metals (i.e. gold and silver) for the large-scale development of plasmonics. Surface plasmon resonances activated by nanostructures are indeed of great interest for applications in electronics, photodetection, solar energy conversion, and telecommunications. TiN is typically deposited in thin film forms by vacuum-phase methods, such as magnetron sputtering, pulsed laser deposition or atomic layer deposition. On the other hand, complex morphologies can be achieved by high-temperature nitridation of titanium dioxide.

In this talk, two main research projects related to TiN will be presented. On the one hand, TiN nanocavities produced by nitridation of anodized TiO<sub>2</sub> will be considered. These nanostructures exhibit a wide-range solar absorption and efficient light-to-heat conversion, thus they offer great potential for solar steam generation. On the other hand, the optical properties and plasmonic performance of TiN thin films prepared by magnetron sputtering at different radiofrequency substrate biasing, leading to different crystal orientations in the films, will be discussed.

### References

P. Patsalas *et al.* *Mater. Sci. Eng. R Rep.* **2018**, *123*, 1.

H. Reddy *et al.* *ACS Photonics* **2017**, *4*, 1413.

### About the speaker:



Luca Mascaretti completed his PhD in Energy and Nuclear Science and Technology in 2018 at the Department of Energy of Politecnico di Milano, with a thesis related to hierarchical TiO<sub>2</sub> nanostructures for water splitting applications. Since April of 2018 he has been member of the Photoelectrochemistry group at the Regional Centre of Advanced Technologies and Materials, Palacký University in Olomouc (Czech Republic). His main

activities are related to TiN nanostructured materials for solar-energy conversion processes, including photocatalysis and solar steam generation. His tasks include material growth by atomic layer deposition, electrochemical anodization, and optical characterization by UV-vis spectroscopy and optical ellipsometry.



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