UNIVERSITÀ DI FERRARA
Dipartimento di Scienze
Chimiche e Farmaceutiche

Via L. Borsari, 46 I-44100 Ferrara Italy
Fax:+39-0532-240709

Università degli Studi di Ferrara

Avviso di Seminario

Si informa che **il giorno 17 Novembre 2020** alle ore 11 la Prof.ssa **Giulia Grancini** (Dipartimento di Chimica, Università di Pavia e École Polytechnique Fédérale de Lausanne) terrà un seminario dal titolo:

Design of Functional Low Dimensional Hybrid Perovskite to Boost Perovskite Solar Cell Stability

A causa dell'emergenza COVID-19 il seminario si terrà online; si potrà partecipare accedendo al Google Meet **https://meet.google.com/who-xjnh-uqr?authuser=1**

Docenti e studenti sono invitati a intervenire.

Dr. Simone Meloni

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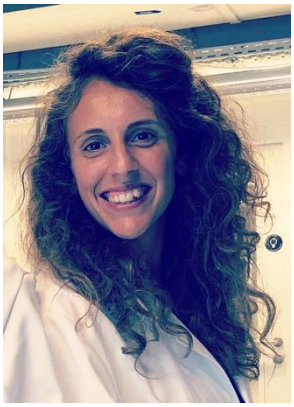
Design of Functional Low dimensional Hybrid Perovskite to boost Perovskite Solar Cell Stability



Giulia Grancini[1,2]

[1] *University of Pavia, Department of Chemistry, Via T. Taramelli 16, 27100 Pavia, Italy*
[2] *GMF, EPFL, Valais Wallis, Rue de l'Industrie 17, CH-1951 Sion, Switzerland*

Solar energy can lead a "paradigm shift" in the energy sector with a new low-cost, efficient, and stable technology. Nowadays, three-dimensional (3D) methylammonium lead iodide perovskite solar cells are undoubtedly leading the photovoltaic scene with their power conversion efficiency (PCE) >25%, holding the promise to be the near future solution to harness solar energy.[1] Tuning the material composition, i.e. by cations and anions substitution, and functionalization of the device interfaces have been the successful routes for a real breakthrough in the device performances.[1] However, poor device stability and still lack of knowledge on device physics substantially hamper their take-off. Engineering two-/three- dimensional (2D/3D) perovskite solar cells is nowadays a popular strategy for efficient and stable perovskite solar cells [1-3].
However, the exact function of the 2D/3D interface in controlling the long-term device behavior and the interface physics therein are still obscure.
Here I will discuss the 2D functions which can simultaneously act as surface passivant, electron blocking layer, a sheath to physically protect the 3D underneath, but also impact on the ion movement and charge accumulation. We found a peculiar dynamical structural mutation happening at the 2D/3D interface: the small cations in the 3D cage move towards the 2D layer, which acts as an ion scavenger. If structurally stable, the 2D physically blocks the ion movement at the interface boosting the device stability. Otherwise, the 2D embeds them, dynamically self-transforming into a quasi-2D structure. [2]
In concomitance, we discovered that the stable 2D perovskite can block ion movement, improving the interface stability on a slow time scale. [2,4]
The judicious choice of the 2D constituents is decisive to control the 2D/3D kinetics and improve the device lifetime, but also can impact on the interface energetics, which can vary and influence

the interface processes and ultimately device open circuit voltage. This knowledge turns fundamental for device design, opening a new avenue for perovskite interface optimization.

References

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[3] V. Queloz et al. J. Phys. Chem. Lett. **10**, 19, 5713-5720 (2019).
[4] A. Sutanto et al. Nano Lett **20**, 3992-3998 (2020)

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