AVVISO DI SEMINARIO

Il giorno 26 settembre alle ore 12.00

nell'aula Seminari **GRASSANO**

Il Dr. Daimiota Takhellambam

terrà un seminario dal titolo

"SnO_2: A Multifunctional Electron Transport Layer Driving the Advancement of Perovskite Solar Cells"

Proponente: Prof.ssa Marilena Carbone

SnO_2: A Multifunctional Electron Transport Layer Driving the Advancement of Perovskite Solar Cells

Dr. Daimiota Takhellambam
Department of Electronics Engineering, Tor Vergata University of Rome.

Perovskite solar cells have rapidly risen to the forefront of photovoltaic research, achieving efficiencies that rival established semiconductor technologies reaching efficiencies more than 26%. A key enabler of this progress is the electron transport layer, where tin dioxide (SnO_2) has emerged as a standout material. From the library of oxide semiconductor primary focus has been given to SnO_2 due to its low temperature processability, ease of fabrication, high conductivity. SnO_2 goes far beyond simple electron extraction. Its favorable band alignment and high mobility facilitate efficient charge transport, while its wide bandgap ensures optical transparency. Equally important, SnO_2 provides chemical and thermal robustness, suppressing degradation pathways that limit device lifetimes. Recent advances in interfacial engineering through passivation strategies, doping, and hybrid modifications reveal how SnO_2 can minimize recombination losses and unlock higher open-circuit voltages. Highlights are given to the insights from charge-carrier dynamics studies that clarify how SnO_2 interfaces govern device performance and stability. By integrating these perspectives, SnO_2 functions not only as a transport medium but as a multifunctional platform central to the development of scalable, durable, and high-efficiency perovskite solar cells. The versatility and ajor potential of SnO_2 is also reflected in processing flexible perovskite solar cells which can be processed through vacuum deposition, nano particle solution processed, or chemical bath deposition of SnO_2.

References:

1. https://www.nrel.gov/pv/cell-efficiency
2. K. Frohna, F. Sahli, J. Werner, F. Fu, M. Jošt, S. Nold, S. Saager, M. Stolterfoht, A. Abate, M. Sessolo, U. Würfel, M. Saliba, B. Niesen, A. Hagfeldt, S. M. Zakeeruddin, M. Grätzel, C. Ballif, *Adv. Energy Mater.* **2022**, *12*, 2103490. https://doi.org/10.1002/aenm.202103490
3. M. Stolterfoht, C. M. Wolff, J. A. Márquez, S. Zhang, C. J. Hages, D. Rothhardt, S. Albrecht, P. L. Burn, P. Meredith, T. Unold, D. Neher, *Adv. Energy Mater.* **2017**, *7*, 1601372. https://doi.org/10.1002/aenm.201601372
4. Y. Wu, A. Islam, X. Yang, C. Qin, J. Liu, K. Zhang, W. Peng, L. Han, *Adv. Energy Mater.* **2018**, *8*, 1703057. https://doi.org/10.1002/aenm.201703057
5. Q. Jiang, Z. Chu, P. Wang, X. Yang, H. Liu, Y. Wang, Z. Yin, J. Wu, X. Zhang, J. You, *Adv. Energy Mater.* **2018**, *8*, 1702719. https://doi.org/10.1002/aenm.201702719
6. M. Kim, G. Jeong, H. J. Park, S. Kim, N. G. Park, *Adv. Energy Mater.* **2020**, *10*, 1903403. https://doi.org/10.1002/aenm.201903403