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2-dimensional MoS2 for photonic applications

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Two-dimensional molybdenum disulfide (MoS2) has attracted significant interest in the field of optoelectronics owing to its direct bandgap, tunable optical properties and the potential for realizing van der Waals heterostructures. It is considered one of the most successful transition metal dichalcogenides, thanks to its exceptional mechanical, electronic, optical, and transport properties that may allow for future radical innovation breakthroughs in different applications [1]. The potential is particular high for light-based applications, thanks to its tunable direct gap in the 1.6 –1.9 eV range. In this talk, I will provide a comprehensive overview of: i) fundamental properties of 2D-MoS2, ii) the main characterization techniques used to study this material, iii) the preparation by chemical vapour deposition (CVD) of 2D MoS2. Among various methods, chemical vapour deposition is considered an excellent candidate thanks to its simplicity, widespread use, and compatibility with other processes used to deposit other semiconductors [2].
Then, I will give a brief overview of the latest developments in light-based devices leveraging MoS2, including photodetectors, phototransistors, waveguides and optical cavities with integrated 2D-MoS2 and single photon sources [3]. By summarizing such recent achievements, I will provide some insights into the high potential offered by this 2D material in photonics.

[1] Yazyev, O. V.; Kis, A. Mater. Today 2015, 18, 20–30.
[2] Seravalli, L.; Bosi, M. Materials. 2021, 14, 7590.
[3] Esposito, F.,Attolini G; Bosi M.; Seravalli, L.; Semiconductor Physics, Quantum Electronics & Optoelectronics (to be published)

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