

## Carbon nanostructures: Revolutionary objects for tackling real-world challenges

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Carbon nanostructures cover a rich family of objects in two, one, and zero dimension. Conceptually, they have in common a hexagonal network of  $sp^2$  hybridized carbon atoms, forming the 2D sheet of graphene [1]. Introducing structural defects and curvature, provides the base for the revolutionary extension into closed hollow 1D nanotube [2] and 0D fullerenes [3]. Their beautiful and highly perfect structure endows each of these low dimensional objects a whole bunch of unprecedented functional properties with world-record characteristics. Having found their way into the market, they offer unique opportunities for the fabrication of novel, high performing device structures and sustainable technologies contributing to tackle major challenges mankind actually is facing.

This presentation will provide a travel through the revolutionary aspects of carbon nanostructures. First, it will cover the fundamental aspects on the relationship between structure and properties. Second, it will concentrate on processing issues and pathways towards sustainable electronic device fabrication. Third, at hand of selected examples of own latest research findings on nanoscale, processing and device performance [4-10], it will lay out the contribution of carbon nanostructures to the field of energy applications as emerging solution to face the challenge of clean and sustainable energy production.

### References:

- [1] K.S. Novoselov, A.K. Geim, et al, *Science* 306, 666-669 (2004)
- [2] S. Iijima, *Nature* 354, 56-58 (1991)
- [3] H.W. Kroto, J.R. Heath, S.C.O'Brien, R.F. Curl, R.E. Smalley, *Nature*, 318, 162-163 (1985)
- [4] M. Peláez-Fernández et al., *Carbon* 178 477-487 (2021)
- [5] E. Palacios Lidón et al., *ACS Mater. Lett.* 3, 1826-1831 (2021)
- [6] S. Victor-Román, *Catal. Today* 357, 350-260 (2020)
- [7] J.M. González-Domínguez et al., *Nanomaterials* 11, 1435 (2021)
- [8] A. Ansón-Casaos et al., *Int. J. Hydrogen Energy* 46, 12180-12191 (2021)
- [9] E Colom et al., *Chem. Mater.* 35, 3522-3531 (2023)
- [10] C. Martínez-Barón, *Green Chem.* (submitted 2024)