

The chemist who has managed to convert carbon-based nanomaterials into materials with biomedical and energy applications

Maurizio Prato, regarded as one of the most influential scientists in the field of carbon nanostructures and molecular nanosciences, has received the 2025 BRTA award in recognition of his research career

Prato's scientific achievements could be used to cure spinal cord injuries and obtain clean energies

Donostia. 26 May, 2025. Carbon is the element that supports life because it is the basis of the molecules that make up living beings, such as proteins, fats, carbohydrates and DNA. Carbon can also be used in the laboratory to obtain nanoscale materials, such as graphene, nanotubes and fullerenes, structures comprising layers the thickness of a single carbon atom in the form of a sheet, tube and football, respectively.

Maurizio Prato managed to implement modifications in these types of carbon nanostructures through a [chemical reaction](#) that bears his name, making it possible to transform materials that are very difficult to process into materials for multiple applications. This pioneering discovery has enabled both his team and many others to develop a wide range of biocompatible, sustainable materials. Maurizio Prato (Lecce, Italy, 1953) is an [Ikerbasque](#) Research Professor and an [AXA](#) chairholder at [CIC biomaGUNE](#), where he heads the [Carbon Bionanotechnology Laboratory](#).

The authors of an article published in [Chemistry - A European Journal](#), one of Europe's leading chemistry journals, argued that Professor Prato's "remarkable contributions to the field of organic chemistry applied to nanoscience focus on innovative, controlled, reproducible protocols for transforming these types of materials into useful, functional materials for detection, catalysis (acceleration of chemical reactions), drug delivery, neurosciences, and energy-relevant technologies". They added that "Prato's tremendous chemical tools have once and for all transformed the outlook for the manufacture of organic nanomaterials. The next revolution in materials sciences is being shaped by Professor Prato's creativity."

Regenerative nanomedicine, sustainable light management and photosynthesis of the future

The CIC biomaGUNE research professor is promoting the exploration of various lines of research in an interdisciplinary environment, which has led him to achieve major advances and open up many lines of research in fields such as biomedicine and energy transition.

His lines of research include the design of materials with carbon nanotubes that could help patients with spinal cord injuries in the future by facilitating nerve regeneration. His proposal to **use carbon nanotubes as regenerative neural prostheses** was recognized with a first Advanced Grant from the European Research Council (ERC) (2008-2013, worth € 2.5 million) and an AXA Research Grant (2016-2026, amounting

to € 800,000). Nanotube implants have enabled motor function in rats to be restored, and the project is currently in its preclinical phase.

Prato's group has succeeded in specifying how to synthesize luminescent carbon nanodots, thus producing a new form of nanocarbon with applications in **sustainable light management** technologies. So in 2021, the Ikerbasque Research Professor received a second ERC Advanced Grant (€ 2.5 million, 2021-2025) to study these carbon [nanodots](#): spherical nanoparticles composed mainly of carbon, with applications in bioimaging, diagnostics, and catalysis.

What is more, he has only recently obtained an ERC Proof of Concept grant that combines the above-mentioned projects. With this funding, they are aiming to use carbon nanodots to obtain accurate images of the anatomical connectivity of nerves, thanks to the nanotubes implanted inside the injured spinal cord (See [video](#)).

Another area in which Prato has made a noteworthy contribution is one of the most ambitious goals of today's scientific community: **artificial photosynthesis**. Inspired by natural photosynthesis, these are processes that seek to use solar energy to produce other types of energy in a clean and efficient way. Since 2010, Maurizio Prato has taken a novel approach to redesigning photosynthesis by using new materials so as to overcome its natural obstacles and thus create highly functional nanointerfaces. Prato's nanomaterials have been instrumental in mimicking the natural process of photosynthesis, thus establishing a new paradigm for solar hydrogen production and the conversion of carbon dioxide into useful chemical compounds.

The American National Academy of Inventors ([NAI](#), p. 38) regards Professor Maurizio Prato as "a key figure in the design and synthesis of custom carbon nanostructures for bionanotechnology applications and for solar energy conversion and storage. His contributions have improved our understanding and control of the chemistry of carbon nanostructures, which are fundamental to technologically relevant applications".

His career is full of awards and recognitions, including the Ciamician-González Prize from the Royal Spanish Society of Chemistry (2008), the Mangini Gold Medal from the Italian Chemical Society, Organic Chemistry Division (2009), the Blaise Pascal Medal from the European Academy of Sciences (2013), the Natta Gold Medal from the Italian Chemical Society (2014), the European Carbon Association Award (2015), the Franco-Italian Chemical Societies Award (2015), the ACS Nano Lectureship Award, the American Chemical Society Award (2015), the ChemPubSoc Europe Fellowship (2018), the Francqui Chair from the Francqui Stitching Foundation in Brussels (2018), the Smalley Prize from the Electrochemical Society of the USA (2019), the E-MRS '5-Year Materials Impact Prize' (2023), and the Raffaele Piria Medal from the Italian Chemical Society (2024). In addition, Maurizio Prato was made a member of the Italian Academy of the Lincei (2010), the European Academy of Sciences (2013), the Academia Europaea (2015), the Venetian Academy of Sciences, Letters and Arts (2018), the US National Academy of Inventors (2021), the Royal Academy of Exact, Physical and Natural Sciences of Spain (2022) and an honorary member of the Gioenia Academy (2025). Prato has also been a professor at the [University of Trieste](#).

The Center for Cooperative Research in Biomaterials [CIC biomaGUNE](#), a member of the Basque Research and Technology Alliance ([BRTA](#)), conducts state-of-the-art research at the interface between Chemistry, Biology and Physics, devoting particular attention to studying the properties of biological nanostructures at the molecular scale, and their biomedical applications. It was recognized in 2018 as a “María de Maeztu” Unit of Excellence for meeting requirements of excellence, which are characterized by a high impact and degree of competitiveness in its field of activity on the global scientific stage.