PRESS RELEASE

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Scientists prepare for the world's smallest race: Nanocar Race II

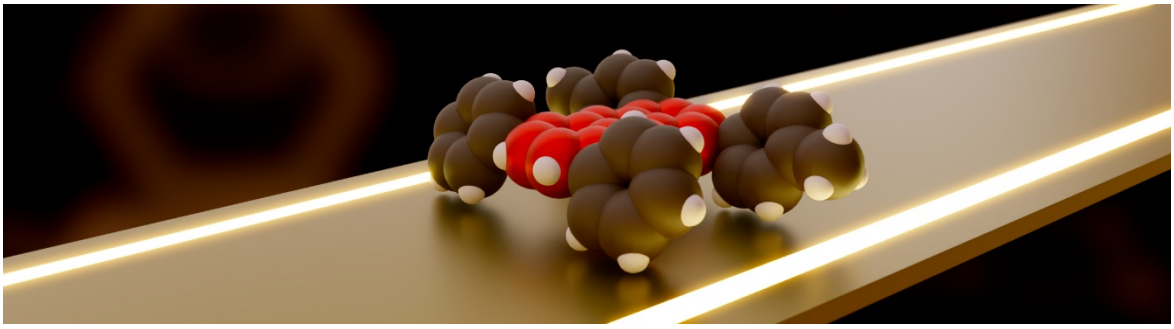


Image: Patricia Bondía (Smallin3D).

- **The Spanish-Swedish team NANOHISPA is one of the eight certified teams that will compete in this second edition of the Nanocar Race.**
- **In the Nanocar Race nano-race, vehicles are molecules conducted by the tip of a tunneling microscope onto a gold surface as a circuit.**

Madrid, March 17th, 2022. The chemical structure allows a nanocar to move on a surface when approached by the tip of a scanning tunnelling microscope (STM). Its propulsion mechanism can be either inelastic (related to the excitation of vibrational modes or to structural changes induced by electric current) or dipole (resulting from repulsion or electrical attraction between the nanocar and the tip of the STM). Typically, a nanocar will travel a few tens of nanometers at a time, so the race happens on a very small scale. In this scenario, it is easy to understand that driving such a small vehicle is a very complex task.

Nanomechanics are already warming up engines for the international Nanocar Race II, happening on March 24th-25th. The Nanocar Race is the world's smallest race, in which vehicles are molecules conducted by the tip of a STM microscope. The molecules are typically very small, composed of about 100 atoms, and with a lateral dimension of about 3 nanometers.

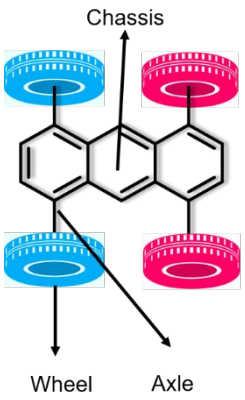
The championship is not available to everyone. This second edition of the Race was registered by 23 teams, but only 8 made it to the final race. The Spanish-Swedish team NANOHISPA, from the institute IMDEA Nanociencia in Madrid (Spain) and Linkoping University (Sweden), is one of the 8 certified teams to compete in Toulouse. NANOHISPA's vehicle is composed of 70 atoms, with toluene rear wheels and benzene front wheels anchored to the anthracene chassis. This minimalist hydrocarbon nanoarchitecture includes a "motor": a permanent dipole moment that makes the car susceptible to gradients of the electric field, and that can be used to propel and maneuver the nanocar.

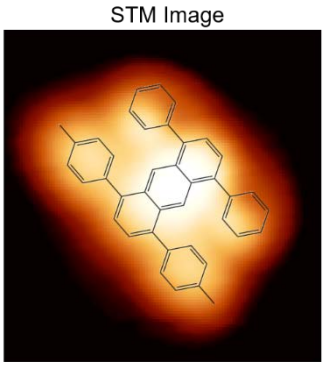
Researchers will travel to Toulouse to compete in the most exciting 24 hours of the nano-race panorama. At the controls of the Madrid's team will be the research group led by Prof. David Écija at IMDEA Nanociencia. The nanocar has been manufactured by the research group of Prof. Emilio M. Pérez, who have synthesized the competing molecule ensuring that it meets all the requirements to be the fastest: low molecular weight, low interaction with the substrate and with a dipole moment as a propulsion mechanism. The theoretical rationalization of the nanocar propulsion mechanism is being developed by Prof. Jonas Björk of Linköping University.

The winner of the Nanocar Race II will be the team that manages to cover the maximum possible distance in a span of 24 hours. All the nanocars will be piloted from a single place, Toulouse, while physically the nanocars will be distributed throughout the world, located in each of the microscopes of the participating institutions: Madrid Institute for Advanced Studies-IMDEA- in Nanoscience (Madrid), Center for Materials Physics (San Sebastian), Technische Universität (Dresden, Germany), University of Graz (Austria), University of Strasbourg (France), International Center for Materials Nanoarchitecture (Ibaraki, Japan), Ohio University (United States) and Paul Sabatier University (Toulouse, France). The ultimate goal of this competition is to advance the development and manipulation of nanomachines capable of performing real work, such as carrying molecular charge.

The competition will be broadcast live from the CEMES-CNRS campus in Toulouse. Drivers will fire engines on March 24th, 2022 at 11:00 to compete for 24 hours in the most exciting competition in the nanoworld.

Live streaming of the race: https://www.youtube.com/watch?v=ofwBAOi01_o





2.3 nm × 2.4 nm; V = 200 mV, I = 20 pA

More information

https://nanohispa.nanociencia.imdea.org/

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