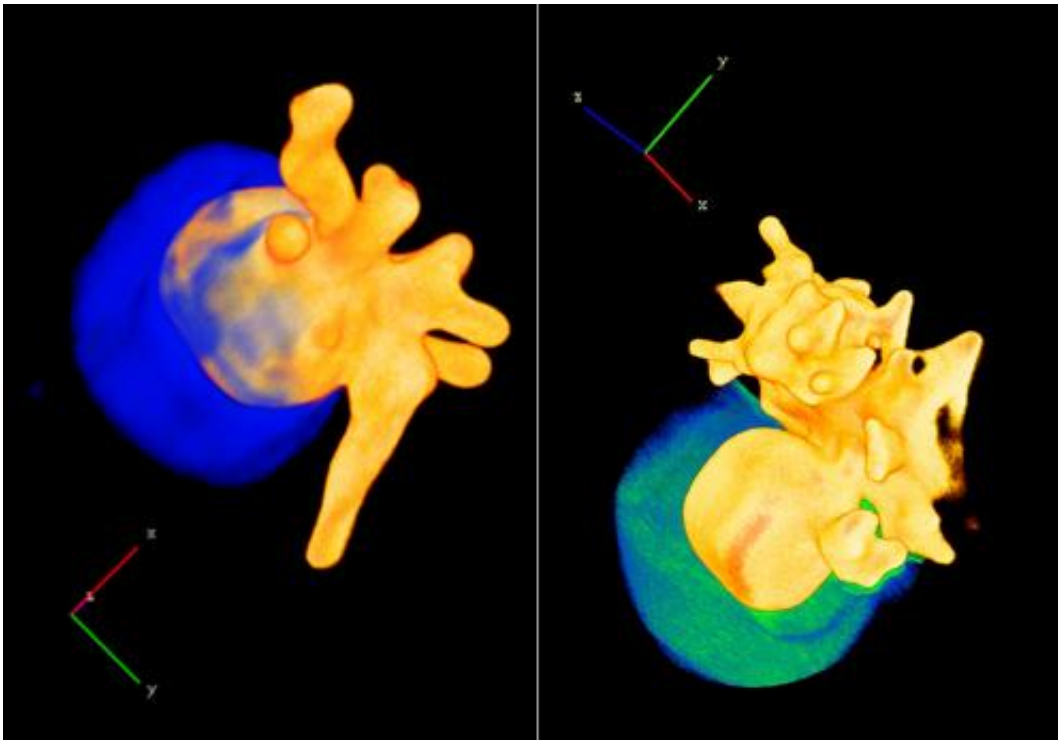


Gold and silica nanoparticles imitate the two faces of the god Janus

February 11 2014



Two examples of nanostars with one silicon oxide face (bluish) and another with golden branches (yellow). Credit: Liz-Marzán et al.

Researchers from the Basque centre CIC biomaGUNE and the University of Antwerp (Belgium) have designed nanoparticles with one half formed of gold branches and the other of silicon oxide. They are a kind of Janus particle, so-called in honour of the Roman god with two faces, which could be used in phototherapy in the future to treat

tumours.

In Roman mythology, Janus was the god of gates, doors, beginnings and transitions between the past and the future. In fact, the first month of the year, January (from the Latin, *ianuarius*), bears his name. This deity was characterised by his profile of two faces, something which has inspired scientists, when naming their chemical designs with two clearly distinct components.

Now, a team of researchers from CIC biomaGUNE in San Sebastian, together with colleagues from the Belgian University of Antwerp, have created Janus particles of nanometric size. They are constituted by silicon oxide on one side and gold points on the other.

As Luis Liz-Marzán, the main author of this study published in the journal *Chemical Communications*, explains to SINC: "These nanostars have optical and electronic properties determined largely by their small dimensions and their morphology."

The researchers have come up with techniques to mould the sharp gold points from [nanoparticles](#) of this metal, such that very intense electric fields can be generated on the gold points using light.



Head of the god Janus in the Vatican Museums. Credit: Looudon Dodd

"Our research is basic science, but these fields are used in processes of ultrasensitive detection to identify negligible quantities of molecules that can be absorbed on the gold face as contaminants or biomarkers that indicate the presence of a disease," says Liz-Marzán.

Another possible application is phototherapy, the object of which is to kill malignant cells using heat, in this case induced by lighting the gold points. The oxide face would be used to join the nanostars to specific biological receptors that would take them to the damaged cells and only to these, so that the metal part can exercise its therapeutic or diagnostic function.

These nanoparticles are produced in various stages. First, golden

nanospheres are produced by the chemical reduction of a salt from the precious metal. Then, two different organic compounds are added on opposite sides of the particle in order to give them distinct affinity due to the [silicon oxide](#). In this way, the oxide covers only one part and the other remains uncovered in order to let the golden points grow.

More information: Denis Rodríguez-Fernández, Thomas Altantzis, Hamed Heidari, Sara Bals, Luis M. Liz-Marzán. "A protecting group approach toward synthesis of Au–silica Janus nanostars". *Chemical Communications* 50: 79-81, 2014. [DOI: 10.1039/C3CC47531J](https://doi.org/10.1039/C3CC47531J).

Provided by Plataforma SINC

Citation: Gold and silica nanoparticles imitate the two faces of the god Janus (2014, February 11) retrieved 10 April 2024 from <https://phys.org/news/2014-02-gold-silica-nanoparticles-imitate-god.html>

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