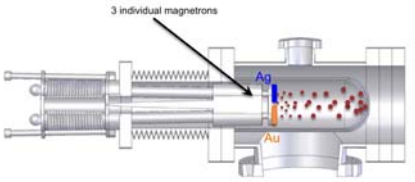
Ion cluster source for the fabrication of nanoparticles with control over size and composition

CSIC has developed an improvement on the fabrication process of nanoparticles: a multiple ion cluster source (MICS) capable of controlling the chemical composition as well as the size of the particles. This modification of a standard ICS also allows adapting the properties of the nanoparticles to the desired application. Partners in any industrial field using nanoparticles may be interested, and are being sought to collaborate in the development of this and further applications, as well as to exploit the existing know-how through a patent license agreement.

Nanoparticles: more than meets the eye

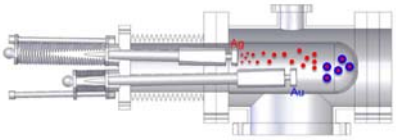
Nanoparticles are used in catalytic processes, data storage (for hard disk manufacture), coatings, and a growing number of scientific and industrial areas. The technique of sputtering as implemented in an ICS is a good choice to fabricate them, but the method lacks enough control capabilities over the chemical composition and size of the resulting nanoparticles. The addition of more magnetrons to state-of-the-art ICS has been identified by CSIC as an interesting way to solve this problem.



Sketch of a MICS for nanoparticles made of alloys

How to put more inside (and get more of) nanoparticles

By reducing the size of the magnetrons it is possible to increase their number inside the aggregation zone of an ICS. Each of the magnetrons has an independent system of positioning and power, and a careful manipulation of working power, gas pressure in the chamber, and position enables a precise control over the structure and size of the nanoparticles.



Sketch of the MICS for core/shell nanoparticles

Main applications and advantages

- Mixtures of gases (containing oxygen or nitrogen for example) can be injected inside the aggregation zone, to favour oxidation or nitruration of materials during the fabrication process of the nanoparticles.
- The possibility of an independent determination of the position and working power of each magnetron allows selecting the elements that form the nanoparticles, as well as their position as core or shell.
- The sputtered material can be of different types (conductor, semi- and superconductors, isolator, piezoelectric, etc.) to gain control over the properties of the product, and enables the fabrication of functionalized nanoparticles.

Patent Status

Spanish patent application and PCT have been filed

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