5 de JULIO de 2023

12.00 h
Aula, Edificio I+D
Campus Río Ebro

INMA Junior

DIRECT WRITING OF Pd-BASED MICRO AND NANOSTRUCTURES, ELECTRON BEAM VS Ga+ BEAM IRRADIATION

Lucía Herrer
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This contribution aims to present the ability to fabricate metal-enriched micro and nanostructures with excellent control of size, shape and spatial orientation from palladium-based spin-coated films. To fabricate the structures, the direct writing strategy has been applied by irradiation through an electron beam and a gallium beam. The study carried out and the results are presented here in a comparative manner.

It has been demonstrated that the irradiation of these films with high electron doses, 30 $mC{\cdot}cm^{-2}$, results in a really low resistivity for the as fabricated PdNS (palladium nanostructures), namely 145 $\mu\Omega \cdot cm$, which is only one order of magnitude higher than the value reported for bulk metallic palladium. When the film is decomposed by means of a gallium beam, a dose as low as 30 $\mu C \cdot cm^{-2}$ is sufficient to produce structures with a metallic Pd content of over 50 % (at.) and an electrical resistivity of 70 $\mu\Omega{\cdot}cm$. Both results pave the way for the development of simplified lithographic processes to fabricate micro and nanostructures with: 1) good electrical conductivity, 2) no need for post-treatment steps, 3) almost unlimited design freedom.

A proof of concept for various applications is presented and the next steps are outlined, including a brief description of the Helium Ion Microscope, Orion Nanofab.

CHARACTERIZATION OF MAGNETIC NANOPARTICLES HEATING PROPERTIES IN THE FRAME OF MAGNETIC HYPERTHERMIA AND PHOTOTERMIA TREATMENTS

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Magnetic iron oxide nanoparticles are extensively used in biomedical applications. In particular, their capacity to generate heat under the exposure of different external stimuli, such as alternating magnetic fields (magnetic hyperthermia) or near infrared light (photothermia), has led to the development of new cancer treatments.

In this seminar, the different methodologies being used to determine the heating capacity of magnetic nanoparticles in the frame of magnetic hyperthermia and photothermal treatments will be presented. As a result from a deep evaluation of such methodologies, different measurement protocols and data analysis methods will be proposed when using both types of stimuli. The main objective of these methodologies is to minimize the differences in specific loss power (SLP) values obtained using different measurement systems, and to help the comparison of results obtained in various laboratories when analyzing similar materials. Furthermore, the impact of nanoparticle coatings on their degradation and the subsequent effect on the particles heating capacity along time will be presented. The particle biodistribution and their transformations in vivo, which is crucial for these therapeutic applications, will also be described.

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