NATIONAL INSTITUTE FOR LASER, PLASMA AND RADIATION PHYSICS

PROCESS OF EXPERIMENTAL REALIZATION OF Ag/SiO_2 MULTILAYER BY OPTIMIZED THIN FILM DEPOSITIONS FOR METAMATERIAL APPLICATIONS

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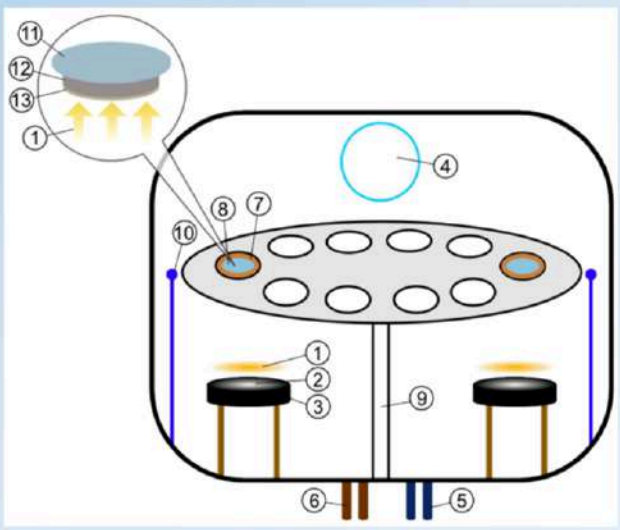
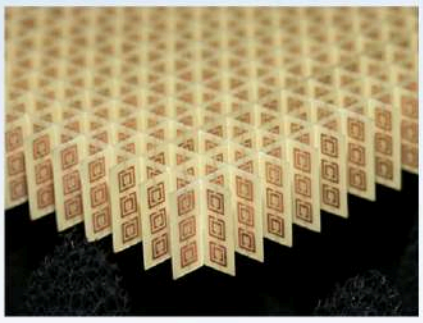


Schematic representation of the magnetron sputtering equipment used to obtain SiO_2 and Ag component layers, which improve the properties of metamaterial structures.

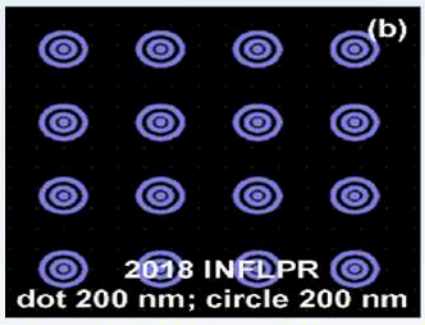
The invention refers to a process for making a recipe using the optimal deposition parameters, with the aim to achieve a **Ag/SiO_2 multilayer** using the magnetron sputtering technique.
In the process, sputtering takes place successively from the SiO_2 and Ag targets, which are placed on two magnetrons in the deposition chamber and in O_2 (for the SiO_2 target) and Ar (for the Ag target) working gas flow, introduced using flowmeters. Their designed, precise shape, orientation, and arrangement of these SiO2 and Ag component layers affect the electromagnetic waves, **to create a structure of metamaterial**. Exactly like an arrangement of artificial structural elements, with advantageous and unusual electromagnetic properties.

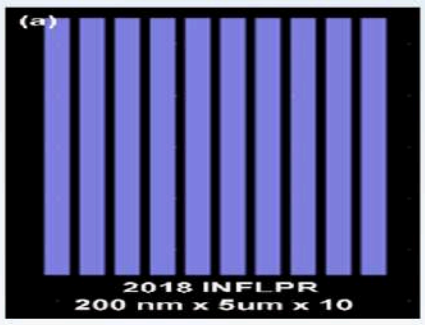
We used metallic, semiconductor, and insulating nanostructures **to construct the metamaterial structures**. From the surface of the targets it is deposited individually, directly on the surface of the quartz substrate, the SiO_2 and Ag component layers, having good crystallographic quality of the layer on large deposition surfaces .

Ag/SiO_2 multilayer

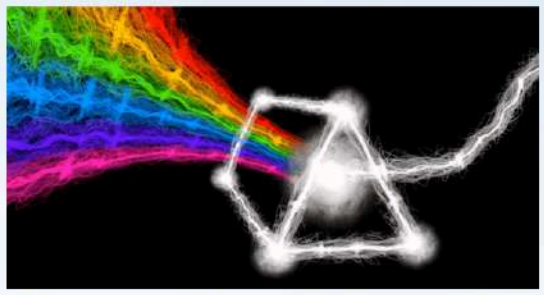


Artificial materials:
Metamaterials





This **Ag/SiO_2 multilayer**, obtained from thin coatings, has dielectric and plasmonic qualities **which improve the properties of metamaterial structures and space microsatellites**



The complex structures that perform a special function, such as transparently blocking a specific color of light.

In the experimental conditions, silver and SiO_2 films with a uniform, reproducible nanoscale structure were obtained. The structural analyses show that the films have a granular-like and pinhole-free microstructure. The crystallites orientation, the granulation and columnar growth are evident in the Ag depositions.

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