

## Optically tailored nanovoid coatings

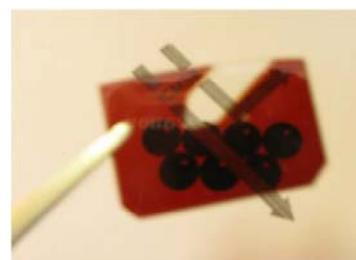
CSIC has patented a new coating with the particularity that contains closed nanopores (nanovoids of 1-50 nm diameter). The manufacture control of the coating microstructure determines the refractive index, color, density, mechanical and other coating properties. This possibility makes the invention useful for a wide range of applications from filters and reflectors working in the desired wavelength, beyond tunable color coatings, heat accumulators for construction and efficiency enhancer of solar cells, without modifying the chemical, thermal and mechanical stability. The new manufacturing method is based on a fully operational technology, so can be easily implemented in the current processing lines to manufacture coatings in industrial scale.

### An offer for Patent Licensing

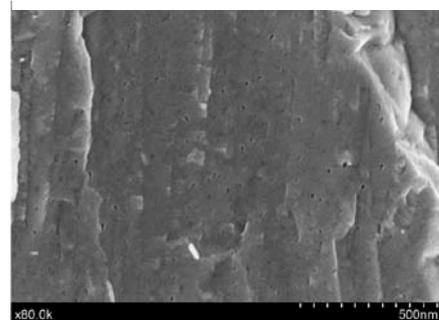
#### Nanostructures controlled fabrication

The process object of this invention makes a specific use under controlled conditions of reactive magnetron sputtering technology to prepare tailored closed porosity coatings by controlling the gases composition, the sputtering power or the target distance.

The nanovoid (closed porosity) are formed directly during the film growth, therefore coatings are produced with no limit of thickness, even in the range of several microns. The microstructure is formed when the sputtering process is conducted in an atmosphere rich in gases like nitrogen or helium. This type of closed porosity modifies the refractive index of the deposited layers in a wide range of values, without a significant change in the chemical or mechanical stability of the deposited material. Therefore, manipulating the presence of such nanovoids specific microstructures can be produced, leading to the desired optical characteristics. Additionally, the conditions can be changed throughout the manufacturing process in order to create coatings consisting of different microstructured layers. This possibility opens the way to produce optical devices with accurate tailored characteristics.



*The new manufacturing method is based on a fully operational technology, so can be easily implemented in the current processing lines to manufacture coatings in industrial scale. The coating color and radiations filtered can be customized.*



#### Main applications and advantages

- The main innovation provided by this invention is the possibility of obtaining porous coatings with the peculiarity that the pores do not have an issue to the surface as those made so far. This distinguishing characteristic eliminates the limits of the layer thickness, which can be produced up to microns.
- The nanovoids fabricated can vary the coating refractive index within a wide range of values, without changing the chemical composition or mechanical and chemical stability.
- The procedure is based on the reactive magnetron sputtering technology, fully implemented in the industry, thus directly applicable to mass production.
- The procedure provides complete control over the coating microstructure, as well as a total homogeneity throughout the coating thickness. This redounds into a precise control of the optical and mechanical properties of the coating.
- The resulting product is a customized color coating presenting an accurate selection of the radiation filtered by it.

#### Patent Status

PCT ("International") patent application filed. Priority established by a Spanish patent application.

#### For further information please contact

Ana García Navarro, Ph.D.  
Material Sciences Area  
Deputy Vice-Presidency for  
Knowledge Transfer  
Spanish National Research Council  
(CSIC)  
Tel.: + 34 – 95 448 95 27  
Fax: + 34 – 95 446 06 65  
E-mail: ana.garcia@icmse.csic.es

