Nanostructure coating made of plasmonic black metal

A research group of CSIC has developed a nanostructured coating with high absorption of visible light. Sputtering at glancing angle (GLAD) combined with a rotating substrate technique is used. This allows a high degree of scalability, efficiency, size control and reproducibility.

Partners interested in a patent license are being sought.

**Black metal light absorption**

Black metal is a type of material with a high absorption in a wide region of electromagnetic spectra, in this case in the visible region (from 400 to 750 nm). Light absorption in metallic structures at submicrometric and nanometric scales is based on localized plasmon resonances. In order to achieve a wide range of wavelengths absorption a certain size distribution of surface structures is needed.

Noble metals are the most used ones in black metal applications owing to their more intense resonances and smaller losses. Among them, gold is the most used metal due to its high resistance to oxidation.

**Sputtering at glancing angle with rotating substrate**

The developed technique is based on the use of sputtering at glancing angle (GLAD) with a rotating substrate. Sputtering has well-known technical and environmental advantages. The process is performed under ballistic regime in which atomic shadowing effects appear. This is a condition for the creation of nanostructured coatings.

The coating is composed by noble metal nanostructures (usually gold) with diameters smaller than 50 nm and a diameter distribution standard deviation large enough to obtain a black metal behaviour in the visible region.

**Main applications and advantages**

- A modified version of the widely used in industry sputtering technique is applied, without harsh environment residues generation and in an energetically efficient way: one step manufacturing at room temperature
- Applicable to any type of substrate and to large surfaces
- Over 85% of absorption between 400 nm and 700 nm when silicon substrates are used
- Applications in radiative heat exchangers, solar energy absorption materials, photovoltaic cells electrodes, separators to avoid cross effects among optical devices, thermal light emitters, biosensors electrodes, catalytic devices and near infrared detectors.

**Patent Status**
PCT patent application filed

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