

Versatile and economical method of manufacturing mixed oxides thin films

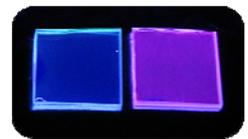
CSIC organization has developed a process for the manufacture of thin films of mixed oxides. The method allows the controlled deposition of oxides of a variety of metals in a simple and economical way. It consists in evaporating metalorganic compounds of the desired metal that are subsequently decomposed by the plasma action, resulting in the cation reaction with oxygen and forming the corresponding oxide thin film.

An offer for Patent Licensing

Replaces the use of expensive metals by economic compounds

Methods based on magnetron sputtering technique that are used nowadays to make thin films doped with cations of other elements have some limitations that the patented process has largely solved. Many of these methods utilize solid sources that are evaporated onto the substrate reacting with the plasma to convert the evaporated metal atoms in their corresponding oxides. Thus, to prepare thin layers of mixed oxides of various cations is necessary either to use a mixed source or various "magnetrons", each of them providing a different metal to be incorporated into the layer. This presents various problems regarding the availability of metal sources or, for certain metals, their stability on exposure to atmosphere. Another highlight significant problem is the cost of these uncommon sources, especially in the case of industrial production where size and characteristics of the targets are important elements to consider.

The process consists in the simultaneous deposition of a ceramic matrix, using a reactive magnetron sputtering source, and the evaporation of a metalorganic compound of at least one cation of the mixed oxide to be grown. The energy and strongly oxidizing plasma generated by the magnetron sputtering process is used to decompose the metalorganic precursor, leading to the reaction of the cation, coming from the metalorganic precursor, with the oxygen contained in the plasma, causing the deposition of an oxide film on the substrate. The metal is incorporated into the ceramic matrix in a proportion which depends on the relative speed of "evaporation" of the two sources involved.



“The method uses stable and common compounds, whose price is consequently lower. Additionally, not being volatile at room temperature, their management does not represent a significant danger.”

Main innovations and advantages

- A more economical method to grow mixed oxide layers of different metals.
- The method avoids the use of expensive metal sources difficult to find and often toxic, using instead metalorganic compounds, cheap, non-volatile and non-toxic. A wide variety of metalorganic compounds are commercially available as a sublimable solid.
- The manufactured thin layers have very good optical and mechanical properties.
- The method is compatible with a wide variety of the available ceramic matrices (SiO_2 , Al_2O_3 , TiO_2 , ZnO ...).
- This technique can be implemented easily in Plasma Vapor Deposition (PVD) set-up already existing. The techniques used, thermal evaporation and magnetron sputtering, are inexpensive and widely implemented in industry.
- The independent control of the sources allows an accurate adjustment of the resulting material stoichiometry.
- The method does not need high temperatures so is suitable for thermosensitive and polymer substrates.

Patent Status

Spanish patent application filed.

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

