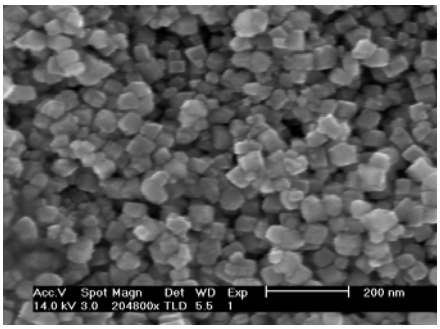
Procedure for the deposition of platinum metal bronzes and its applications in catalysis and fuel cells

A research group of CSIC, in collaboration with the Polytechnical National Institute of Lorraine at the University of Nancy, has developed a new procedure to synthesize metallic platinum bronzes in a coating form. This has many interesting industrial applications. Partners in the pharmaceutical, petrochemical, energetic and food-processing sectors are being sought to collaborate in the development and further applications, and to exploit the existing know-how through a patent license agreement or a collaborative research contract.

An important industrial material

Fabrication of metallic platinum bronze ($Na_xPt_3O_4$) is of outstanding importance in the industries of catalysts and fuel cells, but has faced until recently the impossibility of being grown in large surfaces as demanded by its applications. A new procedure which conjugates vapor deposition of platinum dioxide (PtO_2) onto a sodium ionic conductor and a post-treatment at high temperature solves this problem, and allows to grow large films with Adam's catalyst, composed of platinum (Pt), platinum oxide (PtO) and metallic platinum bronze ($Na_xPt_3O_4$).

This coating is economical and viable compared to state-of-the-art metallic platinum bronze techniques.



Scanning electron microscopy of a synthesized 1 µm-thick coating with a high content of $Na_xPt_3O_4$ crystallites.

Catalytic applications

External tests show that thin films prepared by this new method have a strong catalytic activity in methane steam reforming reaction and water gas shift process to produce H_2 and CO_2. The deposition of the film onto a solid electrolyte allows improving the properties of the system through electrochemical promotion or NEMCA effect.

Fuel Cell Applications

- The metallic platinum bronze $Na_xPt_3O_4$ meets the requirements for its use as fuel cell electrodes, since it has good electrical conductivity, high resistance to chemical corrosion, oxidation and electrochemical reduction, and high bifuncional electro-catalytic activity.
- This new method brings the opportunity to implement metallic platinum bronzes as electrodes due to the possibility of preparing large coating areas.
- The procedure allows tuning the relative amounts of each of these three phases according to the different applications of the compound material.

Patent Status

Spanish patent and international protection via PCT filed

For further information please contact

Miguel Rey, PhD

Material Sciences Area
CSIC Deputy Vice-Presidency for Knowledge Transfer

Tfn: +34 – 91 568 15 19
Fax: +34 – 91 568 15 21 / 15 51
miguel.rey@orgc.csic.es