



Synthesis of Nano sized Bismuth thin films by Metal Organic Chemical Vapour Deposition for Voltametric analysis

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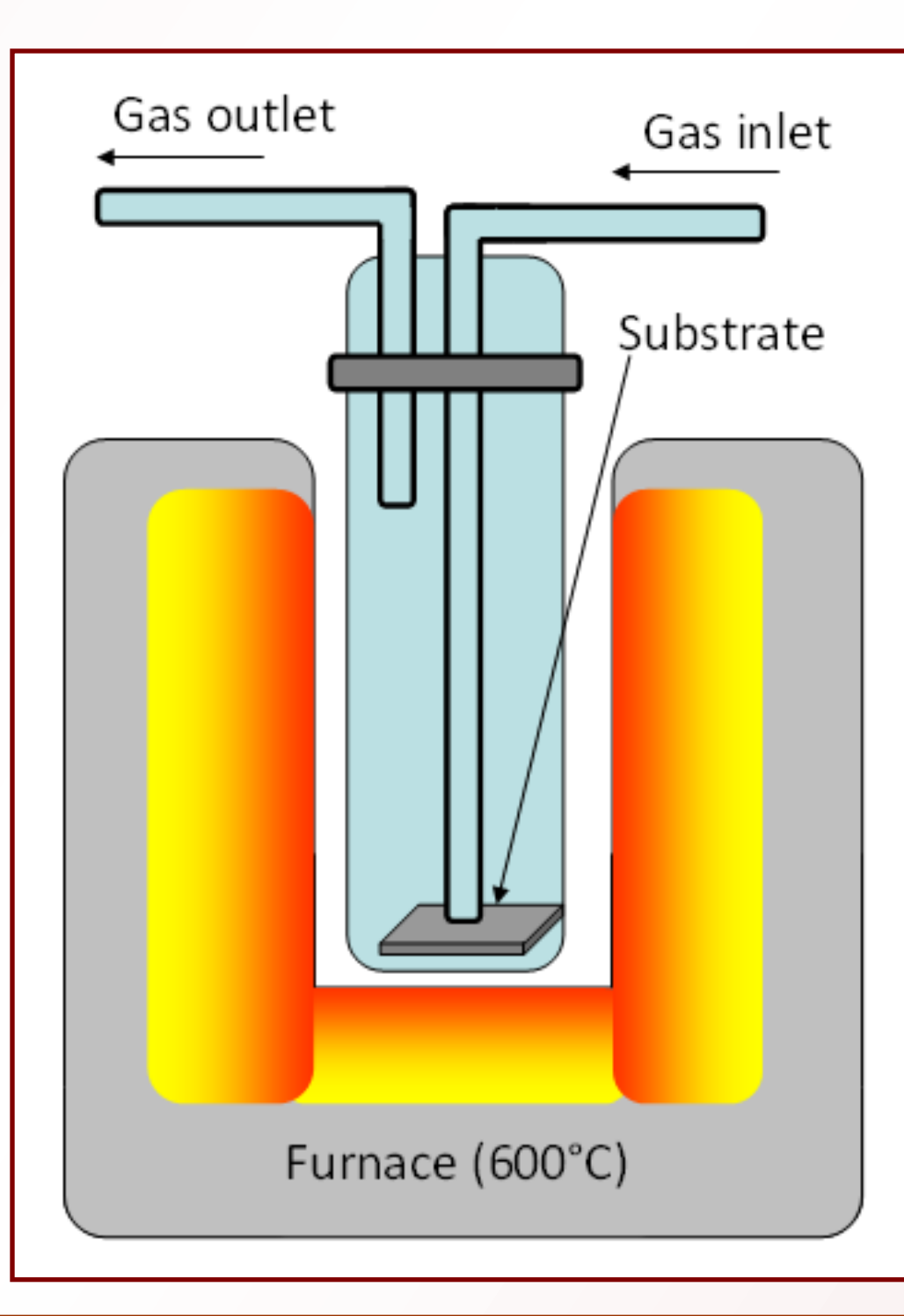
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0. Introduction

Metal organic Chemical vapour deposition (MOCVD) method was used to prepare **bismuth nano particles** from bulk bismuth. This is one of the best methods for depositing thin metallic layers with precisely **controlled thickness**. Nano sized bismuth (NBs) crystals were synthesised from solution containing Bismuth chloride (BiCl₃) in Acetone (CH₃-CO-CH₃). Self assembly of nano bismuth crystals was observed on Shiny surface of **Silicon wafer** and on glass surface used as substrates. Various synthesis parameters were investigated to achieve better depositions, as they significantly affect the formation of self-assembled nano-crystalline bismuth. Grown nano crystallites exist in a single rhombohedral phase with high crystallinity.

1. Growth System

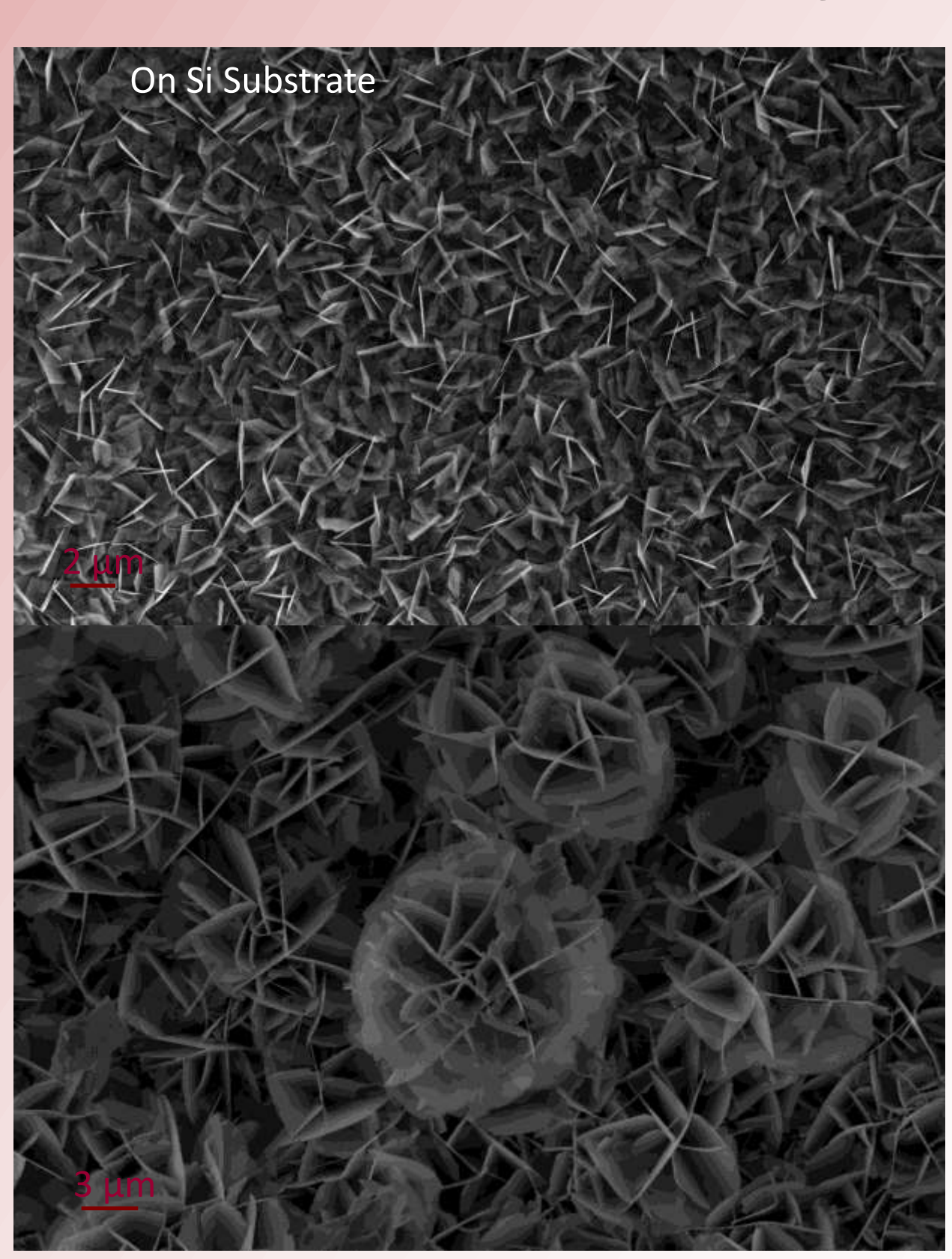
MOCVD is based on the following scheme: the element that is required to generate the crystal is combined with complex organic gas molecules and sends in gas form to the hot surface of substrate.



The heat dissociates the molecule and lead to element atom layer by layer deposition on the surface.
Gas inlet: Ar + reagents nebulized
Reagents: Bismuth chloride (BiCl₃) in Acetone (CH₃-CO-CH₃)

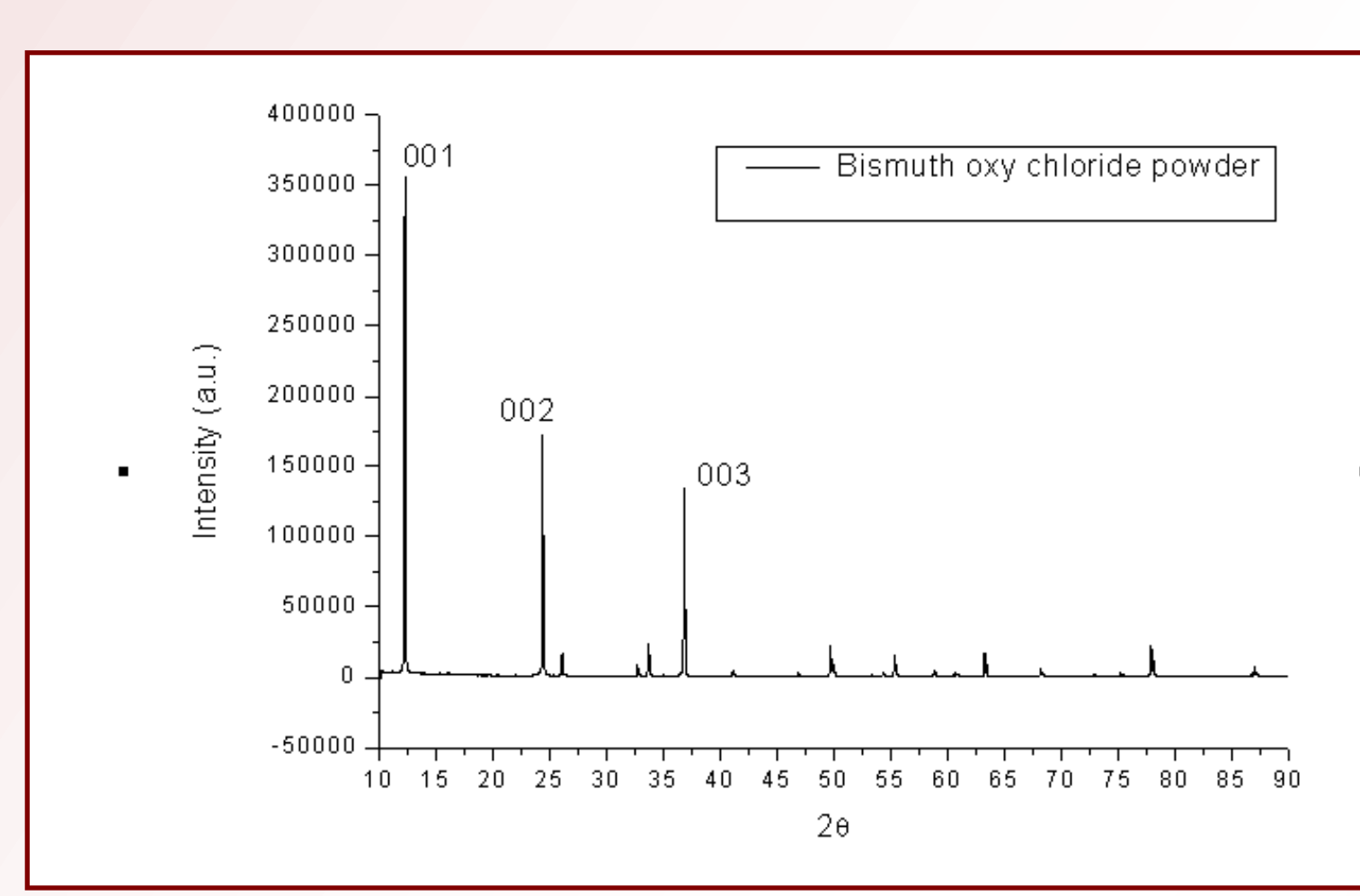
2. Surface Characterization

FESEM (POLITO,Italy)



Crystalline platelets obtained from BiCl₃ are with various thickness from few nanometers to several nanometer.

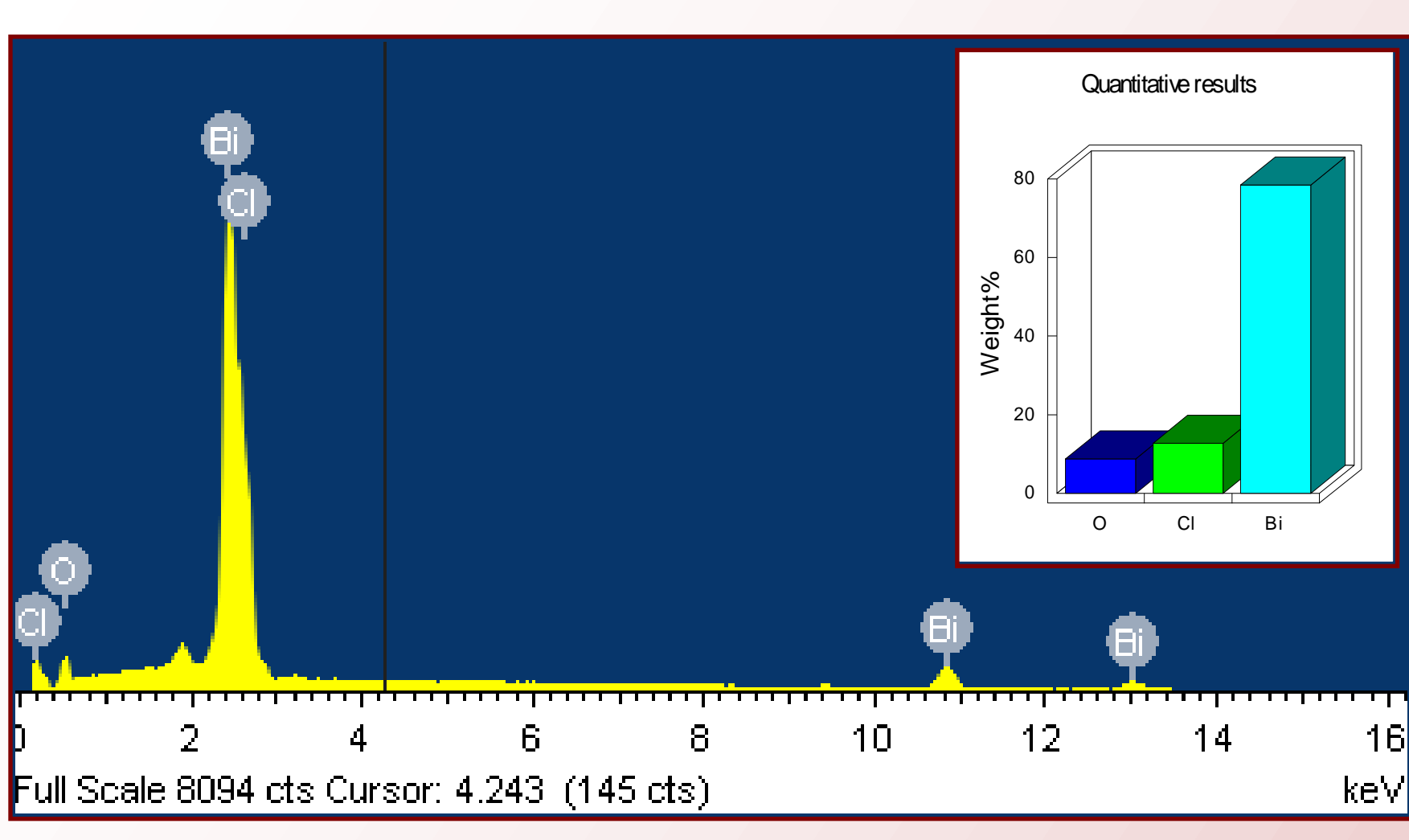
XRD (UPJV,France)



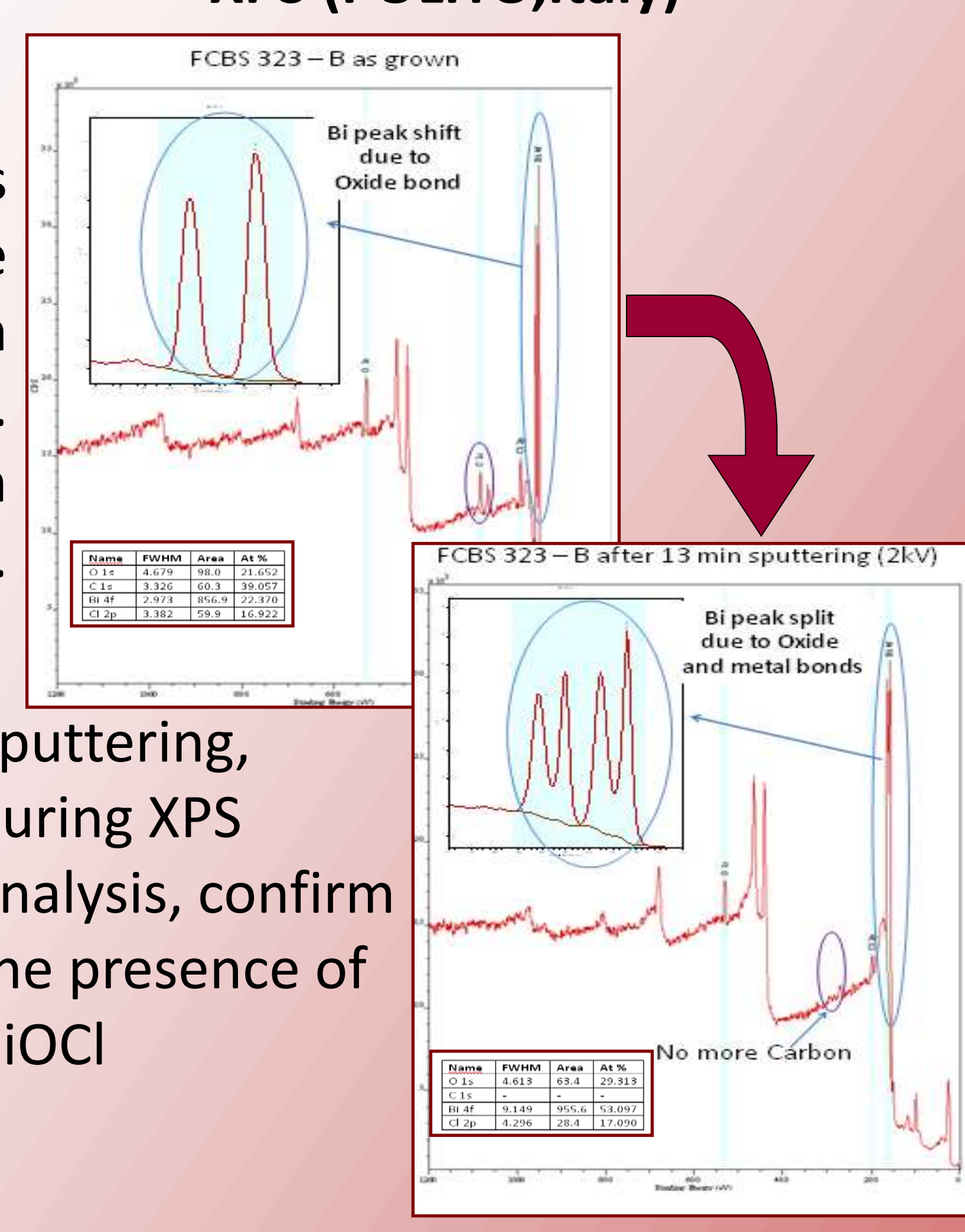
XRD analysis, on samples obtained from BiCl₃, show the major peak at (2θ =) 12° which corresponds to (001) orientation. The peaks are matching with Bismuth Oxy chloride.

EDS (POLITO,Italy)

EDS analysis shows the presence of Bi (~80 %), Cl (~ 18%) and O (~ 10 %).



XPS (POLITO,Italy)



Sputtering, during XPS analysis, confirm the presence of BiOCl

3. CONCLUSIONS

These Crystalline platelets have surface dimensions of a few microns square and thickness of few nanometres. Analysis confirms the Bismuth nanometre-sized crystal structures are in the form of Bis-Oxy chloride (BiOCl).



The Project:

Functionalities of Bismuth-based nanostructures

Bisnano is a Collaborative Project between EU and Mexico (FP7-NMP-2010-EU-Mexico) Focused on research projects Nanosciences, Nanotechnologies, Materials and new Production Technologies

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