INVESTIGATION OF SB2S3 CRYSTALLINE MICRO-DEVICES FOR PHOTONICS APPLICATIONS

LABORATORY : Institut Lumière Matière
IN COOPERATION WITH : Institut des Nanotechnologies de Lyon

LEVEL : M2
TEAM(S) : MNP
SOPRANO

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KEYWORD(S) : photonics / Crystallization / Raman

SCIENTIFIC CONTEXT :

The growing energy demands of electronic computing have led researchers to explore alternatives like optical computing, which offers low power use, and high throughput. Traditional optical systems are bulky and costly, limiting their practicality. Phase Change Materials (PCM) emerged as promising tools for non-volatile refractive index modulation [1,2], but common PCM (VO_2, GST…) suffer from high optical absorption. New PCMs (Sb_2S_3, Sb_2Se_3) provide strong tunability with low absorption in the near-infrared, making them highly promising for photonics chip integration [3].

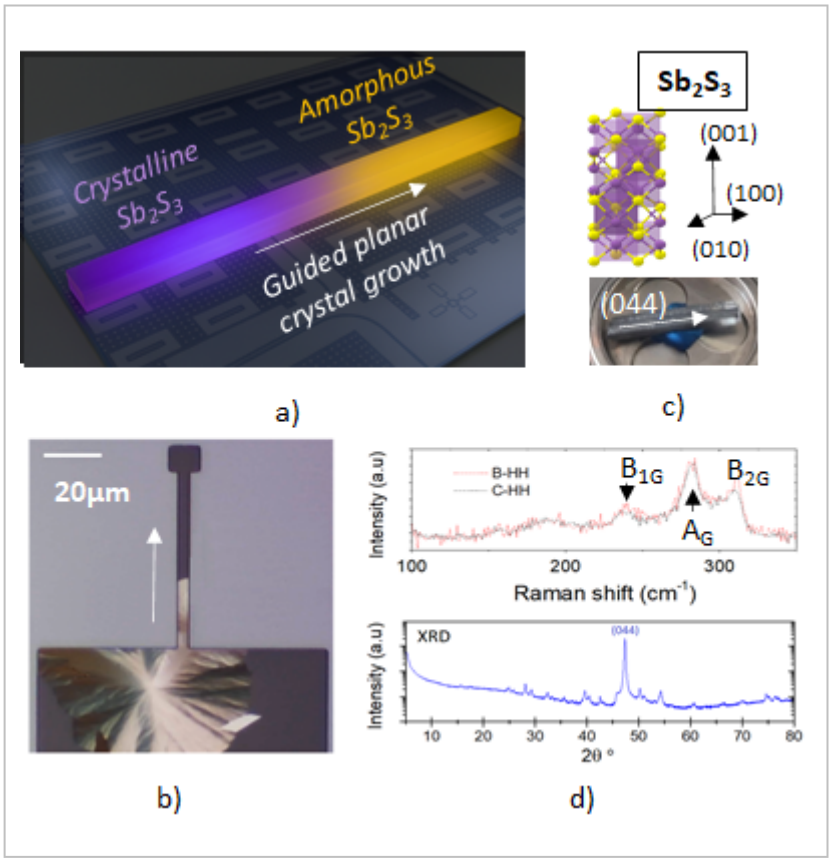

Figure 1 : a) Principle of the guided planar crystal growth in microchannel and b) fabricated devices; c) crystallographic orientation in Sb2S3 bulk crystal and d) Raman spectroscopy compared to XRD characterization in bulk crystal for the (011) orientation.

In this project, we aim to investigate the guided planar crystal growth in microchannel that we recently studied in collaboration with the Institute of Nanotechnology in Lyon (Figure 1-a) [4]. The objective is to understand the crystal growth orientation as a function of the fabricated process flow. For that purpose, we will compare microstructural characterization in the fabricated devices (Figure 1-b) to a bulk crystal (Figure 1-c) using Raman spectroscopy (Figure 1-c) [5] and X-ray diffraction measurements (Figure 1-d) [6].

MISSIONS :

The internship student will be in charge of the device characterization using optical microscopy and Raman spectroscopy for both micro-devices and bulk crystal. Furthermore, he/she will perform X-ray diffraction on the bulk crystal to identify the crystal orientation. The influence of the layer annealing will be also potentially studied.

At the end of the internship, the master student will acquire skills on X-Ray diffraction and Raman spectroscopy and will have a good knowledge on crystalline materials.

OUTLOOKS :

The internship will be potentially followed by a PhD.

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