Laboratory for Photonic Materials and Characterization

EPFL, LAUSANNE

Laboratory for Advanced Materials Processing

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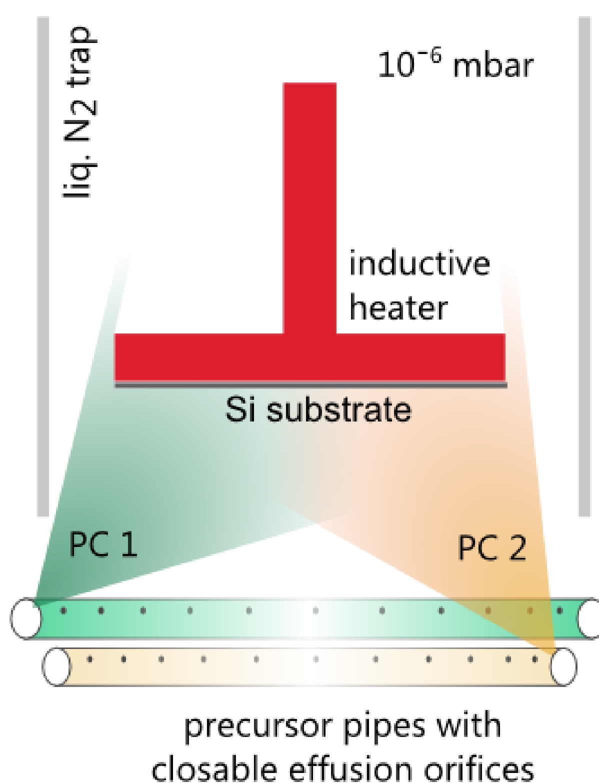
Combinatorial Characterization of Nouvel Precursor by High Vacuum CVD of Barium Oxide Thin Films

In the future more and more devices will be based on integrated optics. Next generation data communication and data processing on-chip will be done optically. This requires new materials and new technologies for fabrication of small optical elements directly on the wafer on the micrometer scale.

We investigate the deposition of electro-optic materials, which will act as the important interface between electronic and optical signal in future integrated circuits; our particular interest is focused on the deposition of barium titanate ($BaTiO_3$). We employ high vacuum chemical vapour deposition (HV-CVD) to form the thin films – a special variety of standard CVD processes, which offers unique advantages to study the deposition kinetics. HV-CVD utilizes volatile molecular precursors, which act as metal sources in the process. For the deposition of barium titanium, in total two precursors are needed: a titanium and a barium precursor.



Schematic Scheme of the HV-CVD reactor. Precursors are effusing from individual gas lines into the high vacuum environment, allowing prediction of absolute precursor impinging rates.

A complete understanding of the process requires understanding the reaction of both precursors individually and together. In this project the candidate will conduct an analysis of deposition kinetics of the barium precursor while growing thin films of barium oxide (BaO). The obtained information about precursor behaviour will be used for deposition of films with predictable properties and also for optimisation of the deposition process of BaTiO3. Such studies have not yet been performed for this precursor in a systematic way.

Film fabrication of will be performed on the HV-CVD reactor available in our laboratory located at EPFL. The films will be characterized in respect to amount of material deposited, film chemical composition and morphology. Structural analysis will be performed by XRD. In combination with information about the absolute precursor flux on the wafer and deposition temperature precise deposition behaviour of the precursor (reaction enthalpies, deposition efficiency, etc.) will be determined.

RESPONSABLE PERSONS:

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