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ALD of Boron Nitride by Polymer Derived Ceramics chemistry

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The scientific interest for hexagonal boron nitride (h-BN) material, especially as thin film and nano-/hetero-structures, is growing owing to its potential use in various domains such as microelectronic, energy, and environment. Atomic Layer Deposition (ALD) is a technique of choice for the fabrication of such thin films and complex nanostructured material. Some ALD processes of BN have been reported; mostly based on ammonia and/or halide precursors. In all cases, the crystalline quality of the as-deposited layers remains insufficient and post-annealing treatments are currently performed. Despite these limitations, ALD demonstrates already to be suited to fabricating BN layers that can successfully be integrated into electronic devices. Based on polymer-derived ceramics chemistry, we developed a two-step ALD process of BN that permits access to various BN thin films and complex nano-/hetero-structures. It consists of the growth layer by layer of preceramic BN films, onto various substrates, at low temperature, and then to its densification into pure BN by annealing process.

Herein, the potential of the ALD process based on the PDCs route for BN thin films will be discussed. Indeed, BN thin films were successfully deposited in a controlled manner on various inorganic and organic substrates/templates. In particular, functional quality crystalline BN nano/heterostructures have been fabricated using substrates or templates with different dimensionalities. Their applications as protective coatings as well as filters and absorbers to purify polluted water from organic/oil have been investigated. The involved mechanism will also be introduced.

Short bio

Catherine Marichy a reçu son diplôme de Master en Chimie spécialité Chimie Inorganique de l'Université Claude Bernard Lyon 1. En 2008, elle rejoint le groupe de N. Pinna à CICECO à l'Université d'Aveiro au Portugal afin de réaliser une thèse. Elle obtient son doctorat en Chimie en 2012. Après un post-doctorat à l'Université de Fribourg (Suisse), elle devient chargée de recherche CNRS, en 2013, au laboratoire des Multimatériaux et Interfaces de l'Université Lyon 1. Depuis 2020, elle est responsable de l'équipe couches minces. Ses activités de recherche portent sur l'élaboration de films ultra-minces et de nanostructures par *Atomic Layer Deposition* (ALD) et *Molecular Layer Deposition* (MLD), leur caractérisation et l'étude de leurs propriétés physico-chimiques.