ALD fabrication of BN nanostructures: environmental applications

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Boron nitride (BN) structures are very attractive materials with applications in various areas such as in energy¹ and environmental domains.² In particular, BN nanotubes (BNNT) have proven to be suited for conversion of osmotic energy.¹ Use of nanotubes arrays or membrane would thus allow osmotic power harvesting under salinity gradients. BN nanostructures like foams and nanotubes have also revealed to be promising for water purification.² ALD technique is an effective approach for surface modification and fabrication of complex nanostructured materials.³ Recently, based on the polymer derived ceramics route, we developed a two-step ALD process that enables using polymer template and fabricating various BN nanostructures.⁴

Herein, the potential the ALD process based on PDCs route for BN nano-/heterostructures will be discussed. Based on trichloroborazine reacting with hexamethyldisilazane, the two-step process consists of the growth layer by layer of a preceramic BN films, onto various substrates, at low temperature, and then to its densification into pure h-BN by annealing process. h-BN thin films were successfully deposited on various inorganic and organic substrates/templates, such as polyacrylonitrile, polycarbonate and carbon nanotubes or fibers. High quality crystalline BN nano-/hetero-structures are fabricated and reveal promising for water treatment.⁵

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