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Nanostructured nitride layers deposited by several Magnetron techniques for CNT growth control

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The importance of the interface substrate-catalyst is being recognized as one important area of research in nano tubes growth. Indeed, the interaction during the CNT growth is a complex substrate-catalyst-carbon multiple interaction. [1] Following the trend, this communication focuses on the magnetron process capabilities to deposit and tailoring the nano-structure of ultra-thin nitride films (< 120 nm, TaN,TiN, AlN) on appropriated substrates with specific properties influencing the growth of carbon nanotubes. Hence, the functionalization of the films by controlling the synthesis (e.g., sizes, phases) of the constituent's compounds in the material such as metal-nitrides crystallites embedded into an amorphous matrix is of the primordial importance. Different material produced in three types magnetron excited plasmas are compared, namely: (i) magnetron operating in so-called 'classical' mode (DC or RF); (ii) ionized magnetron deposition (IPVD with RF loop); and (iii) high power pulsed magnetron. The films are characterized in terms of surface versus bulk stoichiometry (XPS vs. NRA), formed crystalline phases and surface roughness (XRD, Raman spectroscopy, and AFM), and interface-substrate characteristics (HR-TEM). Afterwards, they were used as 'buffer layer' for the CNT growth by CCVD. The influence of the nano-structure of the different ultra-fine "buffer layers" on the carbon nanotubes physical properties are presented and discussed.
[1] B. Bouchet-Fabre et al. Carbon 47 (2009) p. 3424

Keywords
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