

# Characterization of Boron-Carbon-Nitrogen multilayers by several ion, electron and x-ray spectroscopies.

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## Abstract

Multilayers of the elements B, C and N, including B/C and C/BN, have been grown by Ion Beam Assisted Deposition using solid sources for the B and C vapors combined with Nitrogen ion bombardment in a sequential form. The individual layer thicknesses range from 0.5 nm up to 100 nm, to produce a total multilayer thickness ranging from 0.1 to 1  $\mu\text{m}$ .

A detailed characterization of the composition and bonding structure of the materials forming the multilayer has been performed by using different spectroscopies excited by ion, electron and x-rays, to combine their advantages regarding elemental detection limit, chemical state sensitivity, spatial resolution and energy resolution. In particular, the following techniques have been used and are discussed in the present work: GD-OES (glow discharge optical emission spectroscopy), XEDS (x-ray emission energy dispersion spectroscopy), XANES (x-ray absorption near-edge spectroscopy), TEM-EELS (transmission electron microscopy - electron energy loss spectroscopy) and XPS (x-ray photoemission spectroscopy).