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Modulating Low Energy Ion Plasma Fluxes for the Growth of Nanoporous Thin Films

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The growth of nanoporous layers by plasma-assisted deposition techniques is strongly mediated by the ion fluxes in the reactor. To analyze their influence we have deposited different nanostructured thin films by the magnetron sputtering technique at oblique angles, modulating the ion fluxes in the plasma by tuning the frequency of the electromagnetic signal from pure DC to 160 kHz DC pulsed mode. In the DC case, ions possess energies below 5 eV and do not induce noticeable changes in the film structure. However, when the signal is pulsed, ions with energies up to 40 eV impinge on the film, decreasing the porosity of the layers and tilting down the porous/nanocolumnar structures. As a result, we demonstrate that the overall porosity of the layers and the tilt angle of the columns can be tailored as two independent morphological quantities.

Keywords

Controlled porosity

Low energy ions

Nanoporous thin films

Tilted nanocolumns

Glancing Angle Deposition (GLAD)