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Wedge-shaped Thin Films Fabricated by plasma enhanced chemical vapor deposition

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The use of an oblique angle geometry for the deposition of nanostructured films is a common place by PVD (evaporation and magnetron sputtering),1 but practically un-explored by plasma enhanced chemical vapor deposition (PECVD). This is mainly due to the randomization of the plasma gas and precursor molecules in the relatively high pressure used during deposition. In this work we present a new strategy for the fabrication of wedge thin films of ZnO by plasma deposition in a remote plasma reactor using diethyl zinc as precursor. This was dosed in a parallel direction to the substrate surface which was partially shadowed by a well-defined obstacle with a height in the order of some microns. Depending on this geometrical parameter, wedge thin films of different slopes extending up to ca. 200 microns have been prepared. The growth process of these thin films and the evolution found in the orientation of their individual nanocolumns were properly simulated with a statistical model under the assumption that the density of the precursor molecules is depleted in the region just behind the obstacle. Besides their microstructural chracterization by SEM, the films optical properties in the wedge region were determined using a special set-up providing information about refraction index and optical path with lateral resolution of the order of 10 microns. A constantly increasing optical pathwas determined from these measurements. These thin films are primarily intended for metrology applications in optics but could be also of interest for the fabrication of microlenses, in integratedoptics, microfluidics and similar applications. 1.-A. Barranco, A. Borrás, A.R. González-Elipe, A. Palmero. Progr. Mater. Sci. 76 (2016)59-153

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