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GLAD - GLancing Angle Deposition

GLancing Angle Deposition or GLAD is a proprietary method to deposit engineered nanostructured thin films for next generation nano and micro devices.

As a patented thin-film fabrication process, GLAD has been developed by Micralyne and the GLAD Laboratory at the University of Alberta. GLAD combines precision control of wafer motion with physical vapor deposition at glancing or oblique incidence to produce thin films composed of engineered nanostructures.

Conventional methods for fabricating thin films use substrate heating, energetic processes, and near-normal deposition angles to form coatings that are homogeneous, dense, and uniform. GLAD takes the opposite approach by focusing on low adatom diffusion, collimated vapor flux, and extreme substrate tilt angles to create thin films that are anisotropic, porous, and highly structured.

Under these conditions, the thin film growth is dominated by atomic-shadowing, wherein nucleation sites on the substrate evolve into a tilted columnar microstructure (Fig. 1) rather than agglomerate to form a continuous thin film. When precision substrate motion is added to the picture, the tilted columns can be shaped into a variety of exotic nanostructures, including zigzags, vertical posts, helices, and modulated pillars (Fig. 2).

The exact column geometry is controlled largely by how the substrate is oriented during the deposition process, and can therefore be optimized for a particular application. The GLAD process is amendable to a host of inorganic materials, including metals, semiconductors, and dielectrics, and has recently been extended to organic compounds. It is also possible to create GLAD thin films composed of multiple materials and different heterostructures. For example, the GLAD film shown in Fig. 3 is a multilayer architecture created from silicon dioxide and titania.

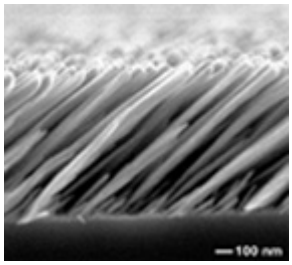

Fig. 1: Columnar Thin Film

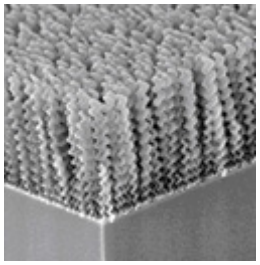

Fig. 2: Helical GLAD Film

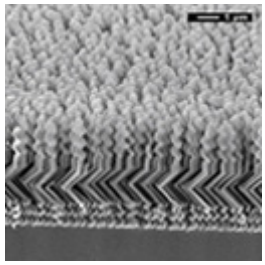

Fig. 3: Composite Multilayer Film

GLAD is a new and exciting platform technology. By taking advantage of the versatility of the GLAD process, it is possible to engineer materials with unique properties for added value in such areas as optical films, gas sensors and chemical devices. Experimentation has also shown that GLAD films can benefit super-capacitors, solar cells, thermal barrier coatings, microfluidics, optical waveplates, photonic crystals, photoluminescent materials, polarization filters, and catalysts.

As a product development example, Micralyne, in collaboration with the GLAD Laboratory at the University of Alberta, is currently developing a high-speed humidity sensor based on GLAD thin films that offers order of magnitude improvements in sensor performance when compared to current commercial technology.

GLAD thin films can serve as the foundation of many different types of microdevices. Micralyne and the GLAD Lab have the infrastructure and technical expertise to manage a GLAD-based development program from concept to high volume production. To learn more, please contact us via email at info@micralyne.com or via phone at 780-431-4400.