A new generation of medical devices based on Biocompatible Ultrananocrystalline (UNCD®) diamond coatings

UNCD films co-developed and patented by O. Auciello and colleagues are synthesized by novel microwave plasma chemical vapor deposition and hot filament chemical vapor deposition techniques using an novel patented Ar-rich/CH4 chemistry that produces films with 2-5 nm grains, thus the name UNCD to distinguish them from nanocrystalline diamond films with 30-100 nm grains. The UNCD films exhibit a unique combination of outstanding mechanical, tribological, electrical, thermal, and biological properties, which already resulted in industrial components and devices currently commercialized by Advanced Diamond Technologies (company co-founded by Auciello and colleagues in 2003). This talk will focus mainly on the application of UNCD coatings for new generation of medical devices, namely:

a) Coating for a microchip implantable in the human retina to restore vision to people blinded by retina disorders to improve biocompatibility of silicon microchips used in implantable electronic components.

b) Coating for metallic prostheses including dental implants, hips, and knees to practically eliminate body fluids-induced corrosion and biofouling in current failing metal prostheses

c) Coating of polymeric devices to improve antifouling properties.

d) Development of a new generation of BioMEMS/BioNEMS devices based on UNCD to increase tribological and biological performance.

e) Development of piezoelectric multilayer MEMS devices based on biocompatible UNCD/AlN, and UNCD/BiFeO for implantable biosensors to replace piezoeactuated BioMEMS based on biologically non-compatible Lead-based piezoelectric PZT.

The biocompatible UNCD coatings are being developed for commercialization in a new generation of implantable medical devices, through a startup company (Original Biomedical Implants (OBI)) co-founded by Auciello and Gurman in 2013.

Biography

Orlando Auciello is the co-inventor of the UNCD technology. He is currently the endow chair Professor at University of Texas at Dallas. He has published more than 500 papers in world-class journals, 20 books, and holds 17 patents on the UNCD technology. Pablo Gurman received his MD from Buenos Aires School of Medicine and has been involved in R&D on micro and nanotechnology for medical applications for the last 7 years. He is the author of 20 publications, and is the editor of 2 books. He holds one patent and has 2 patent pending.

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