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**Research Summary:**

My research focuses on multidisciplinary fields on fundamental and applied science of multifunctional thin films and technological application to multifunctional devices, namely:

- **Complex Oxide Thin Films:** Ferroelectrics films and applications to non-volatile memories, high-dielectric constant films and application to nanoscale CMOS devices and high-frequency devices, transparent conducting oxide films and application to photovoltaics and solar cells.
- **Nanocarbon Thin Films:** Micro and nanocrystalline diamond films and carbon nanotubes (CNT), and application to micro- and nanoelectromechanical systems (MEMS/NEMS-e.g., resonators switches), field emission devices, and high temperature electronics.
- **Micro/Nanobiointerfaces:** Science of biomolecular/inorganic film interfaces involving biocompatible nanocarbon (e.g, micro/nanocrystalline diamond) and oxide (e.g., aluminum and titanium oxides) films, and applications biomedical devices (e.g., artificial retina, bio-inspired electrodes for nerve stimulation) and biosensors.

**Selected Recent Publications:**

“Are Diamonds a MEMS Best Friend?”, O. Auciello, S. Pacheco, A.V. Sumant, C. Gudeman, S. Sampath, A. Datta, R.W. Carpick, V.P. Adiga, P. Zurcher, Z. Ma, H.C. Yuan, J.A. Carlisle, B. Kabius, J. Hiller, IEEE Microwave Magazine, vol. 8, (2008) 61-75

Bias-Enhanced Nucleation and Growth”, Y. C. Chen, X. Y. Zhong, A. R. Konicek, D. S. Grierson, N. H. Tai, I. N. Lin, B. Kabius, J. M. Hiller, A. V. Sumant, R. W. Carpick, and O. Auciello, Appl. Phys. Lett. **92** (2008) 133113.

Science and Technology of Piezoelectric/Diamond Hybrid Heterostructures for High Performance MEMS/NEMS Devices, **O. Auciello**, A. Sumant, J. Hiller, B. Kabius, S. Srinivasan (INTEL), Proc. MRS Symp. Vol. 1052 (2008) pg. 259-263

“Science and Technology of Piezoelectric/Diamond Heterostructures for Monolithically Integrated High Performance MEMS/NEMS/CMOS Devices”, O. Auciello, A.V. Sumant, J. Hiller, B. Kabius, Z Ma, and S. Srinivasan, IEEE publication (2008).

“Thin Film Cu<sub>6</sub>Sn<sub>5</sub> Electrodes: Synthesis, Properties, and Current Collector Interactions”, Il-S. Kim, J.T. Vaughey, and O. Auciello, J. Electrochemical Society Vol. 155, (6). (2008).

“Surface Chemistry and Bonding Configuration of Ultrananocrystalline Diamond Surfaces and their Effects on Nanotribological Properties,” A.V. Sumant, D.S. Grierson, J.E. Gerbi, J.A. Carlisle, O. Auciello, and R.W. Carpick, Phys. Rev. **B 76**, (No.23) (2007) 235429.

“Ultrananocrystalline Diamond Film as an Optimal Cell Interface for Biomedical Applications”, P. Bajaj, D. Akin, A. Gupta, D. Sherman, B. Shi, O. Auciello, and R. Bashir, Biomedical Microdevices vol. 9 (No6) (2007), 787-794.

“Growth and Characterization of Transparent Pz(ZrTi)O<sub>3</sub> Capacitor on Glass Substrate”, K.K. Uprety, L.E. Ocola, and O. Auciello, J. Appl. Phys. **102** (2007) 084107.

Dielectric Properties of Hydrogen Incorporated Chemical Vapor Deposited Diamond Thin Films”, C. Liu, X. Xiao, J. Wang, B. Shi, V. P. Adiga, R.W. Carpick, J.A. Carlisle, and O. Auciello, J. Appl. Phys. **102** (2007) 074115.

“Tribocchemistry and Materials Transfer for the Ultrananocrystalline Diamond-Silicon Nitride Interface by X-PEEM Spectromicroscopy”, D.S. Grierson, A.V. Sumant, A.R. Konicek, M. Albrecht, J. Birrell, O. Auciello, J.A. Carlisle, T.W. Scharf, M.T. Dugger, P.U.P.A. Gilbert, and R.W. Carpick, JVST (2007).

“Electron Paramagnetic Resonance Study of Hydrogen Incorporated Ultrananocrystalline Diamond Thin Films”, C. Liu, X. Xiao, H.H. Wang, O. Auciello, and J.A. Carlisle, J. Appl. Phys. **101** (2007) 123924.

“Piezoelectric/Ultrananocrystalline Diamond Heterostructures for High-Performance Multifunctional Micro/Nanoelectromechanical Systems”, S. Sudarsan, J. Hiller, B. Kabius, **O. Auciello**, Appl. Phys. Lett. **90** (2007) 134101.

“Direct Electrical Detection of Hybridization at DNA-Modified Nanocrystalline Diamond Thin Films”, W. Yang, **O. Auciello**, J. E. Butler, W. Cai, J. A. Carlisle, J. Gerbi, D. M. Gruen, J. N. Russell Jr., L. M. Smith, R. J. Hamers, J. Electrochem. Soc. (in press, 2007).