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Research Summary:

My research expertise is primarily in the area of synthesis, characterization, and processing of CVD-diamond thin films and other carbon based materials such as diamond-like carbon and carbon nanotubes/graphene. My research interests include understanding nucleation and growth mechanism of diamond thin films, surface chemistry of diamond surfaces, micro and nano-scale tribology, micro/nano fabrication, and field emission. At CNM, I am currently, leading the work on the synthesis of various nanocarbon materials and fabrication of multifunctional devices.

Selected Representative Publications:

1. A. V. Sumant, O. Auciello, R. W. Carpick, S. Srinivasan, J. E. Butler, "Ultrananocrystalline and nanocrystalline diamond thin films for MEMS/NEMS applications", *MRS Bulletin*, 35(4), 281, (2010). (Invited review article).
2. O. Auciello and A. V. Sumant, "Status review of the science and technology of ultrananocrystalline diamond (UNCD) films and applications to multifunctional devices", *Diamond and Related Materials*, 19(7-9), 69, (2010). (Invited review article).
3. D. S. Grierson, A.V. Sumant, A. R. Konicek, T. A. Friedmann, J. P. Sullivan, R. W. Carpick, "Thermal stability and rehybridization of carbon bonding in tetrahedral amorphous carbon", *Journal of Applied Physics*, 107, 033523 (2010).
4. J. Liu, D. S. Grierson, N. Moldovan, J. Notbohm, S. Li, P. Jaroenapibal, S. D. O'Connor, A. V. Sumant, N. Neelakantan, J. A. Carlisle, K. T. Turner, R. W. Carpick, "Preventing nanoscale wear of atomic force microscopy tips through the use of monolithic ultrananocrystalline diamond probes", *Small*, 6(10), 1140 (2010).

5. V. P. Adiga, A. V. Sumant, S. Suresh, C. Gudeman, O. Auciello, J. A. Carlisle, R. W. Carpick, "Mechanical stiffness and dissipation in ultrananocrystalline diamond microresonators", *Physical Review B* 79, 245403, (2009).
6. J. E. Butler and A. V. Sumant, "The CVD of nanodiamond materials," *Chem. Vap. Deposition.* 14, 145 (2008). (Invited review article).
7. A.R. Konicek, D.S. Grierson, P.U.P.A. Gilbert, W.G. Sawyer, A.V. Sumant, R. W. Carpick, "Origin of low friction and wear in ultrananocrystalline diamond," *Phys. Rev. Lett.*, 100, 235502 (2008).
8. R. J. Cannara, M. J. Brukman, K. Cimatu, A. V. Sumant, S. Baldelli, R. W. Carpick, "Nanoscale friction varied by isotopic shifting of surface vibrational frequencies," *Science*, 318, 780 (2007).
9. A.V. Sumant, D. S. Grierson, J. E. Gerbi, J. Carlisle, O. Auciello, R. W. Carpick, "The surface chemistry and bonding configuration of ultrananocrystalline diamond surfaces, and their effects on nanotribological properties," *Physical Review B* 76 235429 (2007).
10. A. V. Sumant, D. S. Grierson, A. R. Konicek, M. Abrecht, P.U.P.A. Gilbert, J. E. Butler, T. Feygelson, S. Rotter, R. W. Carpick, "Surface composition, bonding and morphology in the nucleation and growth ultra-thin, high quality nanocrystalline diamond thin films," *Diam. Relat. Mater.* 16, 718 (2007).
11. O. Auciello, S. Pacheco, A. V. Sumant, C. Gudeman, S. Sampath, A. Dutta, R. W. Carpick, V. Adiga, P. Zurcher, Z. Ma, H. Yuan, J. A. Carlisle, B. Kabuis, J. Hiller, S. Srinivasan, "Are diamonds MEMS' best friend?" *IEEE Microwave Mag.* 8(7), 61 (2007).
12. D. S. Grierson, A. V. Sumant, A. R. Konicek, M. Abrecht, J. Birrell, O. Auciello, J. Carlisle, T. Scharf, M. T. Dugger, P.U.P.A. Gilbert, R. W. Carpick, "Tribochemistry and material transfer for the Ultrananocrystalline diamond-silicon nitride interface by X-PEEM spectromicroscopy," *J. Vac. Sci. Technol. B* 25(5), 1700 (2007).
13. A.V. Sumant, D. S. Grierson, J. E. Gerbi, J. Birrell, U. D. Lanke, O. Auciello, J. A. Carlisle, and R. W. Carpick, "Towards the ultimate tribological interface: Surface chemistry and nanotribology of ultrananocrystalline diamond," *Adv. Mater.* 17, 1039 (2005).