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Scientist

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Research Summary:

My research expertise is primarily in the area of synthesis, characterization, and processing of nanocarbon materials including nanocrystalline diamond, carbon nanotubes and graphene. My research interests include nucleation and growth mechanism of nanocarbon materials, electronic and mechanical properties, and surface chemistry of carbon based materials. At CNM, I am currently, leading the work on the synthesis of various nanocarbon materials and developing energy efficient NEMS and nanoelectronic devices.

Awards and Honors:

- R&D 100 award 2013 for developing energy efficient Miraj Diamond platform
- R&D 100 award 2013 for developing NCD plus coating for nano-manufacturing
- R&D 100 award 2011 for developing CMOS compatible RF-MEMS
- Nanocrystalline diamond technology licensed by Intel and AKHAN Technologies Inc.

Selected Representative Publications:

1. Diana Berman, Ali Erdemir, and Anirudha V. Sumant, "Reduced wear and friction enabled by graphene layers on sliding steel surfaces in dry nitrogen", *Carbon*, 59, 167 (2013).
2. Sanket A. Deshmukh, Ganesh Kamath, Gary A. Baker, Anirudha V. Sumant, Subramanian K.R.S. Sankaranarayanan, "The interfacial dynamics of water sandwiched between graphene sheets are governed by the slit width", *Surface Science*, 609, 129 (2013).
3. Anirudha V. Sumant, "Making the diamond age a reality", *Materials Today*, 15(9), 358 (2012).
4. Jie Yu, Guanxiong Liu, Anirudha V. Sumant, Vivek Goyal, Alexander A. Balandin, "Graphene-on-diamond devices with increased current-carrying capacity: Carbon sp^2 -on- sp^3 planar technology", *Nano Letters*, 12(3), 1603 (2012).
5. Vivek Goyal, Anirudha V. Sumant, Desalegne Teweldebrhan, Alexander Balandin, "Direct low-

temperature integration of nanocrystalline diamond with GaN substrates for improved thermal management of high-power electronics”, *Advanced Functional Materials*, 22(7), 1525 (2012).

6. A.R. Konicek, D.S. Grierson, A.V. Sumant, T.A. Friedmann, J.P. Sullivan, W.G. Sawyer, and R.W. Carpick, “Influence of surface passivation on the friction and wear behavior of ultrananocrystalline diamond and tetrahedral amorphous carbon thin films”, *Physical Review B* 85, 155488 (2012).
7. Xinpeng Wang, Leo Ocola, Ralu Divan, Anirudha V. Sumant, “Nanopatterning of ultrananocrystalline diamond (UNCD) nanowires”, *Nanotechnology*, 23, 075301 (2012).
8. Roger J. Narayan, Ryan D. Boehm, and Anirudha V. Sumant, “Medical applications of diamond particles & surfaces”, *Materials Today* (Invited Review article), 14(4), 154, (2011).
9. 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).
10. 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).
11. 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).
12. 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).
13. 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).
14. J. E. Butler and A. V. Sumant. “The CVD of nanodiamond materials,” *Chem. Vap. Deposition*. 14, 145 (2008). (Invited review article).
15. 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).
16. 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).
17. 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).
18. 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).
19. 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).
20. 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).