IBS CMCM Invited talks

Understanding Diamond CVD:
the 'Standard Model'
Mon, June 5, 11am, Bldg. 101, Room. 101

"Nights in the Museum"
Studies of Colorful and Famous Diamonds
Thur, June 8, 4pm, Bldg. 103, Room. 113

"Advances in Single Crystal Diamond:
Enabling Active Diamond Electornics?"
Fri, June 9, 4pm, Bldg. 101, Room. 101

Presented by Dr. James E. Butler

Dr. James E. Butler is currently a consultant in chemical vapor deposition (CVD) and applications of diamond materials in Huntingtown MD, Senior Scientist at Euclid Techlabs, and "Leading Scientist" for a Russian Ministry of Science and Education 'Megagrant' 2013 to 2016 (only 40 awarded in all fields of science each year). He retired from the Naval Research Laboratory (NRL) in 2010 after 38 years of federal service (35 at NRL). At NRL he was the head of the Gas/Surface Dynamics Section where he researched the fundamental chemical processes of CVD with a particular focus on diamond CVD growth mechanisms, surface chemistry, defect characterization, and applications. Dr. Butler received a S.B in Chemical Physics from MIT in 1966, and his Ph.D. in Chemical Physics from The University of Chicago in 1972. Dr. Butler has published over 273 refereed journal papers in experimental chemical physics, including elementary reaction dynamics, chemical kinetics, laser photochemistry, spectroscopy, optical diagnostics, surface chemistry and diverse chemical vapor processing systems. He has given numerous plenary and invited technical presentations at professional society meetings, international conferences, and universities. In addition to serving as technical advisor to ONR, SDIO, NSF, and DARPA on various diamond research initiatives, he has participated as an technical expert in a White House inquiry on controlling trade of 'conflict' diamonds, served a consultant to various companies in the industrial diamond industry, chaired a Gordon Research Conference on Diamond, participated in the organization of numerous international conferences, and serves on the advisory board for the journal Gems and Gemology. He was presented with the Sigma Xi NRL Edison Chapter Applied Science Award in 2001, the NRL Technology Transfer Award in 1995 and 2009, and the Chemical Society of Washington Hillebrand and the Navy's Meritorious Civilian Service Awards in 2010. As of July 2016, his citation metrics were: Researcherid – 9082 citations, H factor 52; Google Scholar – 12393 citations, H factor 59.

Understanding Diamond CVD: the 'Standard Model'

Mon, June 5, 11am | Bldg. 101, Room 101

Understanding the complexity of Diamond CVD requires knowledge of many processes: the decomposition of gaseous reactants, the fluid dynamics and transport of reactive species to the growing surface, the surface chemistry which in the case of diamond CVD, deposits diamond as opposed to graphitic or amorphous carbons, and the role of defects and impurities in the growth and quality of the diamond material. I will present the 'Standard Model' of diamond CVD growth which has been developed over the last several decades. Diamond CVD serves as an example of all the complex chemical and physical processes which occur during the CVD of materials, and provides an excellent platform for the development and testing of theoretical/computational tools since carbon has relatively few electrons and one can draw on the extensive knowledge base of organic and combustion chemistries. Diamond CVD has now enabled new technologies which exploit the extreme thermal, optical, mechanical, electronic, and chemical properties of diamond. CVD Diamonds provide the reproducible quality and morphology for technological applications, and a purity which can exceed that of the best natural diamonds.

"Nights in the Museum" Studies of Colorful and Famous Diamonds

Thur, June 8, 4pm | Bldg. 103, Room. 113

Diamond is an amazing material. I will briefly describe why it is of interest to technology and the scientists. However the bulk of the talk will about the opportunity we have had at the Smithsonian National Museum of Natural History to study a diverse assortment of colorful natural diamonds. This work included the study of rare blue and pink diamonds: the Hope, the Whittelsbach-Graff, Blue Heart and the Aurora Buttlerfly collection of diamonds. The famous Hope and Blue Heart diamonds are national treasures only available to us at night, after the museum is closed. This talk will review studies of these diamonds including phosphorescence, Photo and Cathodo luminescence, FTIR, TOF-SIMS, TEM, and micro Raman.

"Advances in Single Crystal Diamond: Enabling Active Diamond Electronics?"

Fri, June 9, 4pm | Bldg. 101, Room. 101

The last decade has seen significant advances in the growth and quality of single crystal diamond in the laboratory by both Chemical Vapor Deposition (CVD) and High Pressure High Temperature (HPHT) techniques. These advances are now enabling a wide range of new applications for single crystal diamond. I will touch upon many of these diverse applications, but will focus on recent developments that impact and enable the use of diamond in active electronic devices with particular focus on the 'Delta Doping' of diamond.