Rafi Kalish

Physics Department and Solid State Institute

Technion - Israel institute of Technology, Haifa

Diamond-based spintronics and nano-diamond research at Technion

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sala Wataghin, Dipartimento di Fisica, via P. Giuria 1

contatto: **Paolo Olivero (olivero@to.infn.it)**

Dipartimento di Fisica

Università di Torino

Abstract

The application of single photons emitted by specific quantum systems is promising for quantum computers, cryptography and for other future nano-scale photonic applications. The nitrogen-vacancy (N-V) defect center in diamond is currently the most promising candidate for such applications.

The NV center is usually produced by single nitrogen and/or vacancy producing ion implantations into diamond which, following annealing, leads to the formation of the desired defect complex. The single photons emitted by the decay of this center have to be propagated to allow their exploitation. This can best be achieved by realizing very thin wave guides with/or without nano-scale cavities in the same diamond in which NV centers are produced. For this, photonic crystal structures of sub-micron features must be created by, ion-beam induced graphitization and Focused Ion Beams (FIB) processing.

In the present talk we will review the current status of NV formation in diamond and describe the various methods employed to create photonic crystal structures in diamond.

Time permitting, some new and exciting findings on quantum effects in ultra-nano-diamond and field emission from ultra-nano diamond layers will also be presented.

The Author

Rafi Kalish is Professor Emeritus at the Technion - Israel Institute of Technology. He obtained a Ph.D. at the Weizmann Institute (Rehovot, 1966) and during his career he was appointed as Assistant Professor at the Massachusetts Institute of Technology. He obtained numerous prizes and awards, among which the Ben-Gurion University Applied Science Award (1990) and the Miegunyah Distinguished Visiting Fellowship at the University of Melbourne (1996). He authored more than 250 papers, 8 invited chapters in books and 3 books. His research interests are focused on many aspects of diamond-related material science, ranging from charge transport and ion implantation and doping to photonics and ultra-nanocrystalline phases.