平成 25 年 5 月 1 日

各位、

東北大学電気通信研究所
ブロードバンド工学研究部門
超ブロードバンド信号処理研究分野　教授
尾辻　泰一

第 67 回ナノ・スピン工学研究会・通研講演会の開催について

拝啓、時下ますますご清祥のこととお喜び申し上げます。
さて、下記の通り第 67 回ナノ・スピン工学研究会・通研講演会を開催致しますので、
皆様多数ご参集下さいますようご案内申し上げます。

敬具

記

東北大学
通研講演会
第 67 回ナノ・スピン工学研究会
ーテラヘルツ波帯グラフェンデバイスー

日時：　2013 年 5 月 17 日(金) 13:30－15:00
場所：　東北大学　電気通信研究所　ナノ・スピン研究棟　４階　A401 室
〒980-8577　仙台市青葉区片平２－１－１
言語：　英語

プログラム：

5/17
13:30 – 15:00

"Nanomaterials with charged quantum dots for solar energy conversion and advanced sensing applications" (in English)

Prof. Dr. Vladimir MITIN　Dept. Electrical Eng., University at Buffalo, USA

The presentation focuses on design, fabrication, and characterization of novel quantum dot (QD) structures with potential profile engineering and manageable kinetics of photoelectrons. Our approach is based on engineering of photoelectron capture processes using various configurations of manageable potential barriers around separated QDs and collective barriers around QD clusters. Potential barriers around QDs are always created, when electrons from dopants outside QDs fill the dots. To effectively control photoelectron capture processes, the barrier height should be of the order of the thermal energy of electrons. Such barriers can be created by Quantum dots with Build In Charge (Q-BIC) that is controlled by the type and by the level of doping. By combining Q-BIC with various positions of dopants it is possible to create unique distribution of potential barriers, which forces photoelectrons to move in designated direction without capturing into the QDs. Besides manageable photoelectron lifetime, the novel structures provide also stronger coupling to radiation, high scalability, low generation-recombination noise in sensing applications and effective harvesting of infrared energy in Q-BIC solar cells. It was experimentally demonstrated that responsivity of QD infrared photodetectors at nitrogen temperatures can be increased by more than 30 times using Q-BIC structures. Experimentally demonstrated increase of the short circuit current due to additional absorption in QDs is at least 9 mA/cm^2 that lead to a substantial increase in the efficiency of solar cells with InAs Q-BIC in GaAs (the highest short circuit current in GaAs solar cells is about 29 mA/cm^2, so GaAs with Q-BIC solar cells should give at least 37 mA/cm^2 current).

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