2015 中技社外籍研究生科技研究獎學金

CTCI Science and Technology Research Scholarship for International Graduate Students in Taiwan

TAIWAN TECH National Taiwan University of Science and Technology

偏壓增強成長超奈米鑽石薄膜應用於橫向場發射、顯示器以及光檢測器
Bias enhanced grown Ultra-nano crystalline diamond films based lateral electron field emitter, Microplasma display devices and Photodetectors.

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研究概述 Research abstracts

Displays are an essential interface in machine-based communication among human beings. There has been a major development in the display technology with the potential to enable television, handheld computers and mobile phones to be more functional and user friendly by leading display manufacturing countries such as Japan, Taiwan and Korea etc. Carbon-based field emitters provides sufficient current densities for displays applications. However, long-term stability and low emission are the major issues for most of the carbon-based devices. Nevertheless fabrication of conducting cathode field emission materials using diamond films, which are robust, reproducible, yield sufficient and uniform electronic properties. The bias enhanced diamond films can achieve long life time cathode materials compete with CNTs, ZnO, graphene and other carbon materials. Other hand, a simplistic fast-response photodetectors and UV field emitters were fabricated based on diamond films with long lifetime stability.

研究成果 Research Results

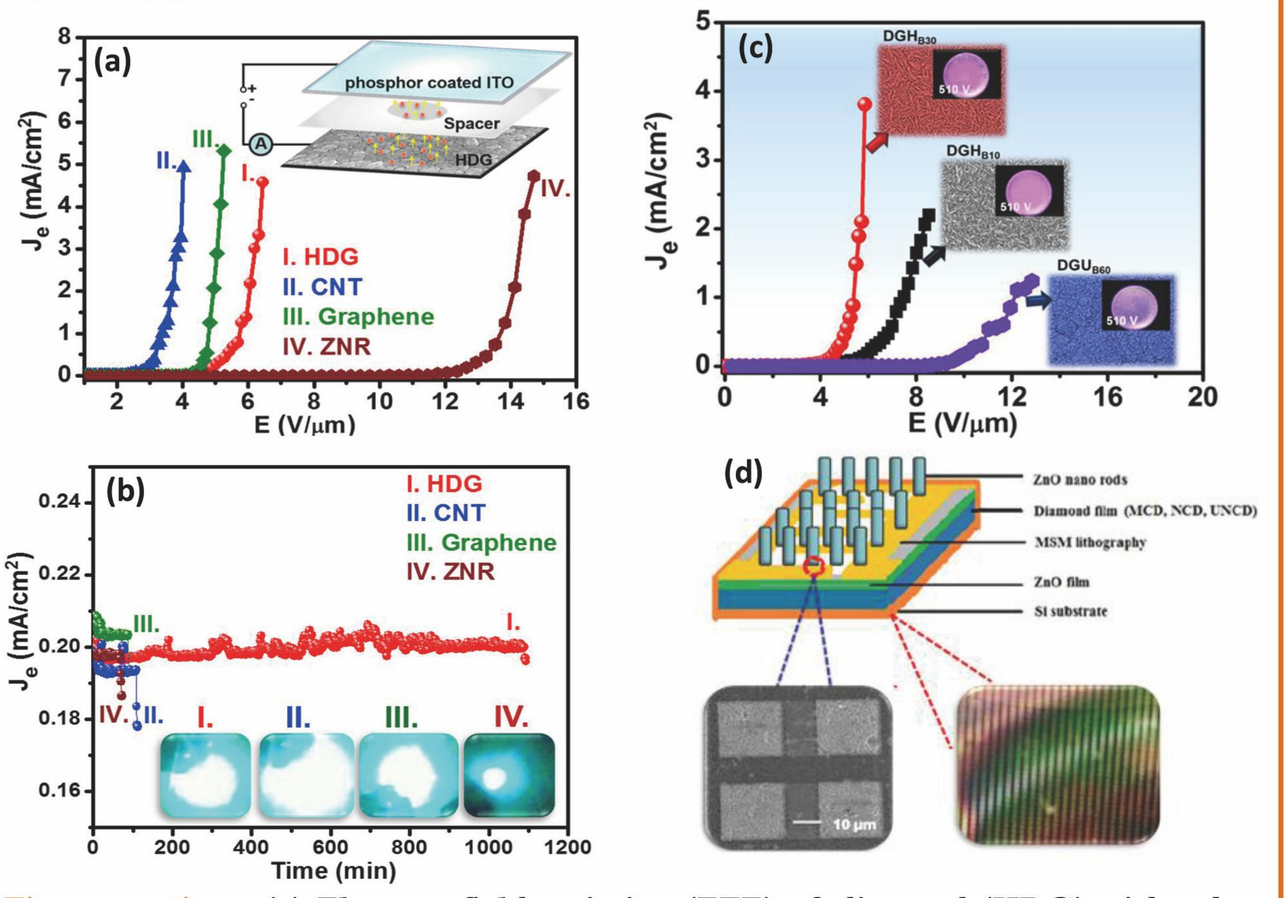

Figure captions. (a) Electron field emission (EFE) of diamond (HDG) with other materials (b) Life time studies of diamond materials with other materials (c) EFE of highly conducting diamond materials with enhanced plasma illuminations (d) Fast response UV Photodetector based on diamond materials

Ref: Adhimoorthy Saravanan.et.al. ACS Appl. Mater. Interfaces 6 (2014) 10566
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❖The Bias-enhanced nucleation and growth (BEG) is the one of the outstanding methods for the growth of conducting diamond films at low temperature using MPCVD system. The biased diamond materials is a simple process for next generation cold cathode electron sources for display devices due to high brightness and longer lifetimes (1072min), which is better than other materials such as CNT, grpahene and ZnO (Fig (a) (b).

❖We synthesis low temperature (~450°C) of a diamond-based nano-carbon composite material using CH_4/N_2 plasma with *in-situ* application of bias voltage. The electron field emission (EFE) properties, which is superior to those achievable in other kind of conducting diamond films reported sofar, Such a unique structure renders the material very conductive (s=714.8 S/cm).

❖Other hand, We utilize the diamond films as UV photodetector (PD), since UV PD's play an important role in monitoring UV radiation for human. The ZNRs/diamond based device performances thus overcome the poor stability of other materials such as bare ZnO, bare CNTs, ZnO/CNT and Au/ZnO.

研究經歷 Research experience

I am pleased to introduce myself as **Adhimoorthy Saravanan,** 3rd year PhD student from National Taiwan university of Science and Technology (Taiwan Tech). My research is based on characterization and fabrication of Electron field emitter's, Display devices and Photodetectors. This should be a great place to thank my Mom who always bless me from heaven and my PhD supervisor's **Prof/Dr. Bohr-Ran-Huang, Prof/Dr. I-Nan Lin**, and my labmates for their continuous supports, lead to achieve this prestigious CTCI award.

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