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Negative photoconductivity effect in nano diamonds

Diamond has a wide range of applications in oil and gas exploration, aerospace, precision machining, optoelectronic devices, computer chips and other fields due to its extremely high hardness, high thermal conductivity, wide band gap, high carrier mobility, and good chemical stability. As the nanometer-sized form of diamond, nanodiamonds (NDs) have received increasing attention owing to their low toxicity, stable fluorescence, facile functionalization, and good biocompatibility. A large number of studies have already demonstrated their applications in bioimaging, drug delivery, biosensing and catalysis. However, little studies on the photoelectronic properties of nanodiamonds.

In this talk, we show that under the illumination of ultraviolet (UV) light, the conductivity of the nanodiamonds has been decreased greatly, which has been named negative photoconductivity effect (NPE). The mechanism of the negative photoconductivity effect has been attributed to the trapping of carriers by the absorbed water on the surface of the nanodiamonds. Based on the NPE phenomenon, humidity and temperature sensors have been fabricated. The sensitivity of the NDs-based humidity sensor can reach 106 %, which is the highest value ever reported for carbon-based humidity sensors.

Biography

Prof. Chong-Xin Shan obtained his bachelor degree from Wuhan University in 1999, and PhD degree from Changchun Institute of Optics, Fine Mechanics and Physics, Chinese Academy of

Sciences in 2004. From 2004 to 2008, he worked in sequence as a postdoctoral researcher in The Chinese University of Hong Kong and The University of Nottingham, United Kingdom. He got a professorship in Changchun Institute of Optics, Fine Mechanics and Physics in 2008. In 2014, he moved to Zhengzhou University, and currently is the Dean of School of Physics and Microelectronics. His research interest is mainly focused on carbon based semiconductor optoelectronic materials and devices. He has authored/coauthored over 300 peer-reviewed papers or book chapters.

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