Abstract Submitted
for the MAR17 Meeting of
The American Physical Society

Plasma enhanced ultrastable self-powered visible-blind deep ultraviolet photodetector based on atomically thin boron nitride sheets[1]
PETER XIANPING FENG, MANUEL RIVERA, RAFAEL VELAZQUEZ, physics department, Univ of Puerto Rico, ALI ALDALBAHI, Department of Chemistry, King Saud University — We extend our work on the use of digitally controlled plasma deposition technique to synthesize high quality boron nitride nanosheets (BNNSs). The nanoscale morphologies and layered growth characteristics of the BNNSs were characterized using scanning electron microscope, transmission electron microscopy, and atomic force microscopy. The experimental data indicated each sample consists of multiple atomically thin, highly transparent BNNSs that overlap one another with certain orientations. Purity and structural properties were characterized by Raman scattering, XRD, FTIR and XPS. Based on these characterizations, 2D BNNSs based self-powered, visible blind deep UV detectors were designed, fabricated, and tested. The bias, temperature, and humidity effects on the photocurrent strength were investigated. A significant increase of signal-to-noise ratio after plasma treatment was observed. The fabricated photodetectors presented exceptional properties: a very stable baseline and a high sensitivity to weak intensities of radiation in both UVC and UVB range while remaining visible-blind, a high signal-to-noise ratio, and excellent repeatability even when the operating temperature was up to 400 0C. The shift in cutoff wavelength was also observed.

[1]This work is supported by the Army Research Office/DoD grant (62826-RT-REP) and the ISPP0058 at King Saud University

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Date submitted: 10 Nov 2016 Electronic form version 1.4