

Abstract Submitted
for the MAR14 Meeting of
The American Physical Society

Photostability of thin exfoliated black phosphorus ALEXANDRE FAVRON, Université de Montréal, SÉBASTIEN FRANCOEUR, Polytechnique Montréal, RICHARD LEONELLI, RICHARD MARTEL, Université de Montréal — In its bulk form, black phosphorus has a direct gap of about 0.3 eV. Because of its lamellar structure, similar to that of graphite, black phosphorus can be exfoliated down to a single monolayer. The interesting properties is the possible tuning of the energy gap in the Near-IR using control of the layer thickness, which is of great interesting to develop sensors and other Near-IR optoelectronic devices. Preliminary studies on thin exfoliated layers revealed a fast photo-induced oxidation of black phosphorus, in room condition with an excitation higher than 1.8 eV. Using Raman spectroscopy as a probe of the quality and integrity of exfoliated layers, we present in this talk the results of a dynamical study of the photo-oxidation process at room temperature in a controlled atmosphere with the presence of the oxygen-water redox couple. A photo-induced charge transfer from black phosphorus to the redox couple is found to be responsible of the fast deterioration of the structure. Finally, we present Raman and Photoluminescence results on un-oxidized thin-layers measured at low temperature using different passivation schemes.

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Date submitted: 14 Nov 2013

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