Abstract Submitted
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Raman signatures of degradation in mono-, bi- and trilayers of exfoliated black phosphorus[1] ALEXANDRE FAVRON, ETIENNE GAUFRES, Universite de Montreal, FREDERIC FOSSARD, Laboratoire d'Etude de Microstructure, ANNE-LAURENCE PHANEUF-L'HEUREUX, Polytechnique Montreal, ANNICK LOISEAU, Laboratoire d'Etude de Microstructure, RICHARD LEONELLI, Universite de Montreal, SEBASTIEN FRANCOEUR, Polytechnique Montreal, RICHARD MARTEL, Universite de Montreal — Thin layers of black phosphorus have recently raised interest for their two-dimensional (2D) semiconducting properties, such as tunable bandgap with layer thickness and high carrier mobilities. This lamellar crystal of P atoms can be exfoliated down to monolayer 2D-phosphane (also called phosphorene) using procedures similar to that for monolayer graphene. The devices are however challenging to fabricate due to fast degradation of the thin layers upon exposure to light in air. We investigated this degradation process using in-situ Raman and transmission electron spectroscopies and reported on a thickness dependent reactivity of the layers. Moreover, the degradation process was identified to be due to an ubiquitous photo-induced oxidation of the layers by adsorbed oxygen in water. Optimum experimental conditions to prepare n-layer 2D-phosphane in their pristine states were applied to determine the Raman signatures of degradation. Here, we report on the use of the ratio of intensity of the A1g over A2g modes as an assessment of the crystal quality.

[1]RQMP,CRSNG,FRQNT

Alexandre Favron
Universite de Montreal

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