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Phosphane-ene polymer networks: From bulk preparation to thin films *via* molecular layer deposition (MLD)

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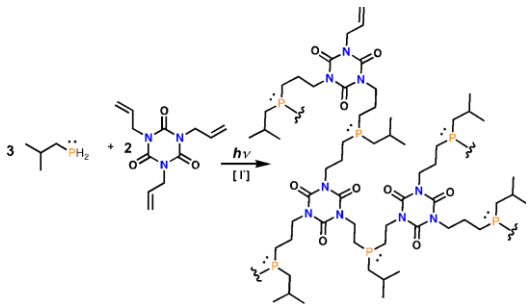
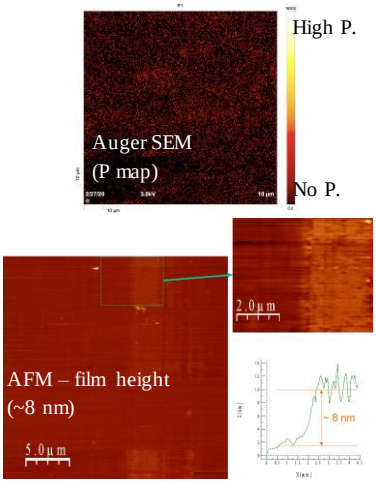
The Ragogna Group's central focus is to discover new fundamental chemistry for the main group elements. Over the past several years we have prepared photopolymers *via* the phosphane-ene reaction, which are materials rich in P content, and where established phosphorus chemistry can be utilized to derivatize and elaborate the polymer (Scheme 1a). Bulk materials have been leveraged for the preparation of metal-phosphide containing ceramics. Thin films prepared by spin coating (~1.5 µm in thickness) have been patterned, functionalize with metals (e.g. Al, Sb, Co, Mo, Cu) and pyrolyzed to produce ceramics with excellent shape retention characteristics (Scheme 1b). Most recently, we have shifted our phosphane-ene polymer science from the bulk to the nanoscale, and have successfully deposited uniform, thin films (~10-40 nm in thickness; Scheme 1c) of phosphane-ene polymers using molecular layer deposition (MLD). This represents the first example of such a film containing a main group element outside of C, O, N and S (rare).

Scheme 1a:
Phosphane-ene photopolymer network.



Scheme 1b:
TPC = Tokyo Police Club (Rock band from Toronto).

Scheme 1c:



References
[1] *Chem. Mater.* **2015**, *27*: 1412–1419; **[2]** *Angew. Chem. Int. Ed.* **2018**, *57*: 13252-13256; **[3]** 'Photopolymerization of Primary phosphines with olefins to Generate Phosphorous Based Polymer Networks' File date (PCT): September 13, 2018 (PCT/CA2018/051136); Priority No: 62/558,093; **[4]** *ACS Appl. Mater. Interfaces* **2020**, *12*, 27640–27650; **[5]** *Chem. Eur. J.* **2020**, *26*, 12751-12757.