**Synthesis of 2D GaN and InN using liquid metal solvents**

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Most metals feature an atomically-thin oxide layer at the metal air interface. This also applies to liquid metals including molten tin, indium, gallium and their alloys.1 In many cases this oxide layer grows in a self-limiting reaction providing a pathway towards atomically-thin, two-dimensional materials.1-4 This talk will discuss different liquid metal-based synthesis strategies for 2D materials and will highlight how large area ultrathin sheets can be isolated form the liquid metal interface. The isolated oxide sheets may then be used as a precursor for compound semiconductors. We report the synthesis of centimeter sized ultrathin GaN and InN.4 The synthesis relies on the ammonolysis of liquid metal derived two-dimensional (2D) oxide sheets that were squeeze-transferred onto desired substrates. Wurtzite GaN nanosheets featured typical thicknesses of 1.3 nm, an optical bandgap of 3.5 eV and a carrier mobility of 21.5 cm2V-1s-1, while the InN featured a thickness of 2.0 nm. The deposited nanosheets were highly crystalline, grew along the (001) direction and featured a thickness of only three unit cells. The method provides a scalable approach for the integration of 2D morphologies of industrially important semiconductors into emerging electronics and optical devices.



Figure 1: Synthesis schematic, optical images of Ga2O3 and GaN, as well as AFM and TEM characterization

**References:**

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