What Has Been Achieved: A tightly iterated closed loop between experiment and theory in the NSF Materials Innovation Platform Two Dimensional Crystal Consortium at Penn State is revealing new insights into the growth and properties of 2D materials. This includes groundbreaking work on the interpretation of optical probes – a key area for emerging data-centric approaches of 2D systems, the development of leading interatomic potentials to describe complex growth processes, and new ways to control the atomic-level structure of these systems.

Importance of Achievement: These new insights and capabilities are now being made available to the community through the MIP platform, including new hyper spectral optical imaging modalities in the 2DCC’s highly integrated vacuum environment (HIVE) and making use of the LiST Lifetime Sample Tracking data curation tool.

Unique Features of the MIP That Enabled Project: Close iterative interaction between synthesis, characterization, and theory efforts.

Publications (from top left down each column):

Defect coupling:

Exciton regulation:
MD Potentials:

Intervalley:

Stripes:
Nano Lett., 2016, 16, 6982–6987

Exciton defect: