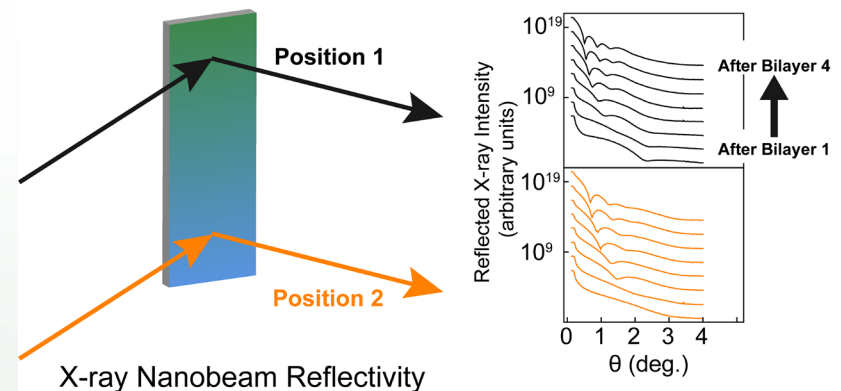
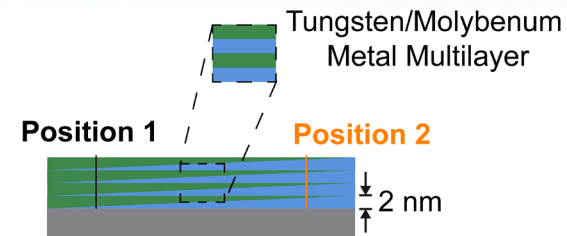


# Speeding the Discovery of Materials Synthesis Techniques using *In Situ* Synchrotron X-ray Nanobeam Characterization

Paul G. Evans (U. Wisc.-Madison), Hua Zhou (Argonne Nat.  
Lab.), Christopher Muratore (U. Dayton), N. Glavin (AFRL)

The creation of novel materials often involves the painstaking and time-consuming synthesis and characterization of a series of samples with small differences. This process is slow and slows the pace of materials innovation. For example, creating sequences of thin layers of metals is an important route to the discovery of new 2D materials for quantum electronics, but it is slowed by the need to explore a large range of thicknesses of the individual layers.

Researchers from the Wisconsin MRSEC, Argonne National Laboratory, the University of Dayton, and the Air Force Research Laboratory developed an experiment that monitors synthesis of a single sample incorporating a wide range of thicknesses in a single experiment using *in situ* synchrotron nanobeam characterization. This approach builds on the design and construction of x-ray instrumentation by the Wisconsin MRSEC and promises to speed up development of new 2D materials.



*A multilayer composed of four bilayers of amorphous W and Mo was created with a thickness gradient. X-ray nanobeam reflectivity (with wavelength 1.03 Å) at two positions along the thickness gradient followed the bilayer-by-bilayer evolution of the structure during its synthesis and provided insight into growth processes in a single deposition experiment.*