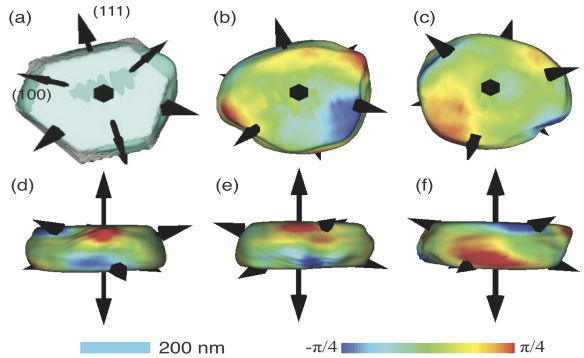
Nanoscale Imaging for High Pressure Sciences using 4GSRs

Scientific Opportunity

Understanding and control of ***nanometer-scale pressure driving science*** in matter.

Breakthrough Techniques

Large transverse coherence and high brilliance will enable atomic interface imaging, strain (pressure) driving domain migration and phase transition. (i) enhances CDI resolution (ii) allows multiple domians probed simultaneous and (iii) watching dynamics with XPCS.



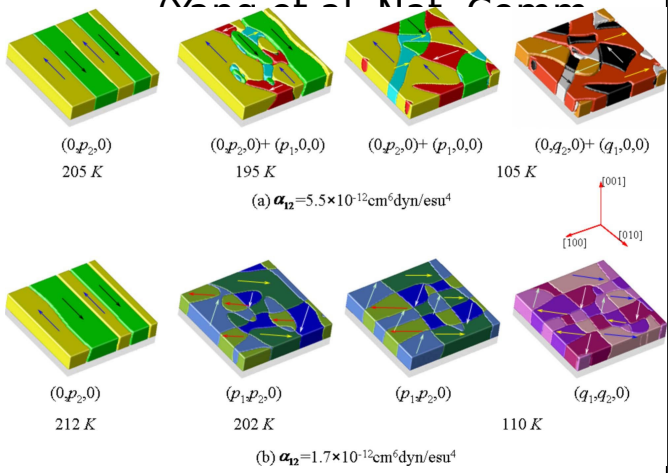
3d Internal strain distribu-tion of single crystal Au under pressure (1.7 GPa)

30 nm spatial resolution is achieved within one single isolated crystal in DAC using CDI.

(Yang et al. Nat. Comm.

Ferroelectric domain migration driving by high pressure.

Much higher spatial resolution is need. Mapping the domain shape, size, strain distribution will Pressure induced FE to PE or PE-FE phase transition will provide us fundamental understanding of the mechanism on enhancing the material

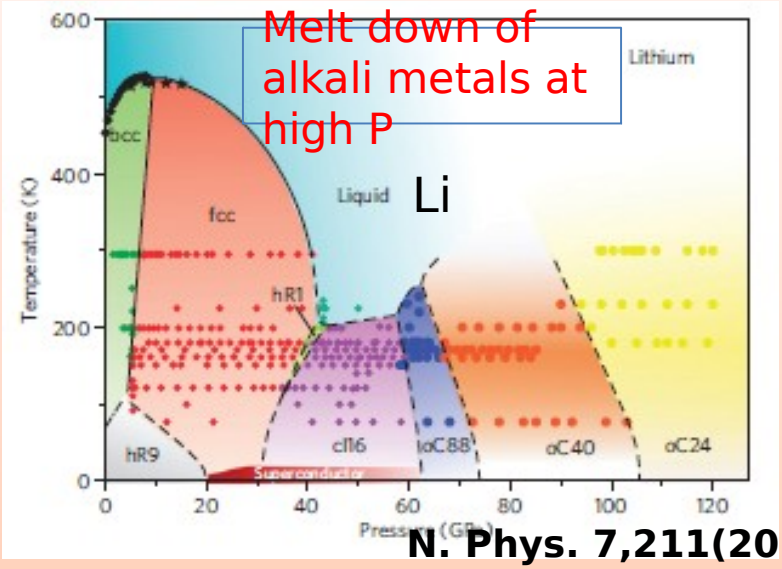


Influence of anisotropic strain on the ferroelectric properties of SrTiO3thin films on DyScO3 substrates (PRB 79,224117 (2009)

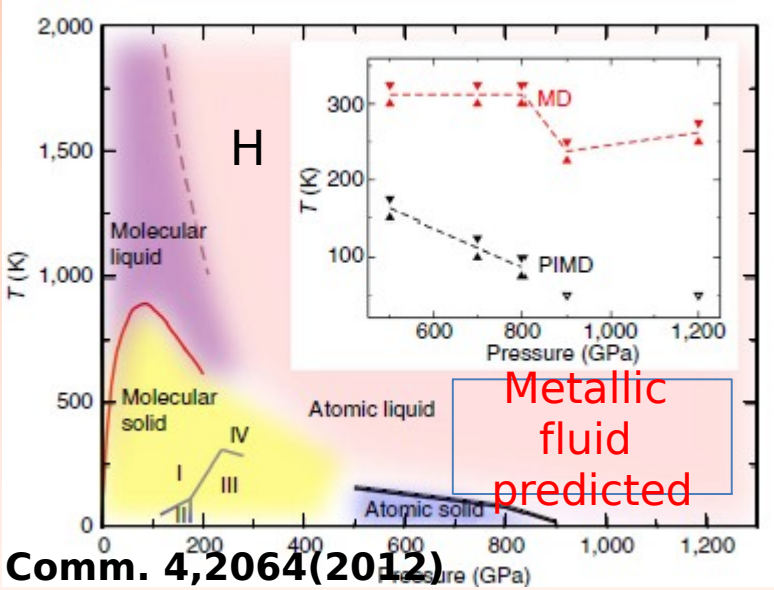
obing Hydrogen HP Phase Dia

Metallic phase of hydrogen at ultra-high pressure has been predicted, with exotic properties , like RT superconducting and superfluid. The structural determination of metallic phase has been the grand challenge for high pressure community. Is H another alkali metal, like Lithium?

Currently only phase I (P<109 GPa) is experimentally determined. The MBA upgraded source would enable the crystalline diffraction studies with powder or micron single crystal from the lightest element at multi-Megabar



N. Phys. 7,211(2011)



N. Comm. 4,2064(2012)