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Coherent X-ray Surface Diffraction: Speckle from the Surface Reconstruction Layer of Gold (001) MICHAEL S. PIERCE, KEE-CHUL CHANG, DANIEL HENNESSY, Argonne National Laboratory, Materials Science Division, ALEC SANDY, MICHAEL SPRUNG¹, Argonne National Laboratory, Advanced Photon Source, HOYDOO YOU, Argonne National Laboratory, Materials Science Division — We present preliminary results of the first coherent x-ray diffraction from an atomic monolayer surface reconstruction and demonstrate how this technique is capable of providing new information about surface dynamics. Speckled scattering patterns were successfully collected from ordered surface atoms on Au (001) crystals in high vacuum. We have collected data at the (001) anti-Bragg point as well as coherent scattering data directly from the in-plane hex reconstruction peak. These two points can provide complementary information about in-plane and out-of-plane surface dynamics. Below 1050 K, the system appears to remain in equilibrium maintaining a small constant fraction of non-reconstructed surface for a given temperature. However we observe the speckles continue to evolve within the collected scattering patterns indicating that the non-reconstructed portion of the surface rearranges slowly. Above about 1050K, we find that the rate of speckle decorrelation rapidly increases for very small changes in temperature. Signal to noise makes this a difficult experiment with existing light sources. However we expect this technique to become easier and more broadly applicable with future X-ray sources.

¹currently at DESY

Michael S. Pierce
Argonne National Laboratory, Materials Science Division

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