

## **Time-Resolved X-Ray Photoelectron Diffraction of Graphene on SiC**

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We report the expansion for the first time of x-ray photoelectron diffraction (XPD) to the ultra-fast time domain by implementing it as a pump probe photoemission technique.

XPD has been among the most successful structural probes. However, it can be considered a static technique: until now, a corresponding time resolved technique was lacking in the case of ultra-fast phenomena. We have demonstrated that XPD can indeed be expanded to the time domain, down to the fs time scale. The expansion to the time domain allows structural probing in surfaces at ultra-fast time scales, giving a completely new tool for the direct observation of surface structural dynamics.

The novel technique has been implemented at the FLASH free electron laser facility at DESY (Hamburg) by using a time-of-flight momentum microscope, and it has been applied for the first time to give structural information on the dynamics of a quasi-freestanding monolayer graphene sample following excitation by an ultra-fast 800 nm laser pulse