Abstract Submitted
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Efficient evaluation of epitaxial MoS_2 on sapphire by direct band structure imaging[1] HOKWON KIM, DUMITRU DUMCENCO, MATHIEU FREGNAUX, Ecole Polytechnique Federale de Lausanne, ANASS BENAYAD, CEA, LETI, YEN-CHENG KUNG, ANDRAS KIS, Ecole Polytechnique Federale de Lausanne, OLIVIER RENAULT, CEA, LETI, LANES GROUP, EPFL TEAM, LETI, CEA TEAM — The electronic band structure evaluation of two-dimensional metal dichalcogenides is critical as the band structure can be greatly influenced by the film thickness, strain, and substrate. Here, we performed a direct measurement of the band structure of as-grown monolayer MoS_2 on single crystalline sapphire by reciprocal-space photoelectron emission microscopy with a conventional laboratory ultra-violet He I light source. Arrays of gold electrodes were deposited onto the sample in order to avoid charging effects due to the insulating substrate. This allowed the high resolution mapping (ΔE =0.2 eV; Δk =0.05 Å^{-1}) of the valence states in momentum space down to 7 eV below the Fermi level. The high degree of the epitaxial alignment of the single crystalline MoS_2 nuclei was verified by the direct momentum space imaging over a large area containing multiple nuclei. The derived values of the hole effective mass were 2.41 0.05 m_0 and 0.81 0.05 m_0, respectively at Γ and K points, consistent with the theoretical values of the freestanding monolayer MoS_2 reported in the literature.

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HoKwon Kim
Ecole Polytechnique Federale de Lausanne

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