

# Atomic Reconstruction at Engineered van der Waals Interfaces

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## Abstract

Twisted interfaces between two-dimensional (2D) van der Waals (vdW) materials enable control of structural symmetry and functionality at the atomic scale. Varying the stacking angle produces moiré superlattices and lattice reconstruction, where interlayer registry competes with intralayer strain to form ordered domains with emergent electronic, optical, or ferroic properties. This talk will show how stacking configurations and reconstruction govern domain formation and functionality, examined by electron diffraction contrast in transmission electron microscopy (TEM). By integrating TEM with semiconductor device fabrication, we perform operando measurements of domain dynamics in working devices, directly linking local symmetry breaking to macroscopic responses such as ferroelectric switching in twisted bilayer TMDs[1]. Extending to multilayers introduces additional interfaces and symmetry degrees of freedom, yielding complex tessellations with distinctive structural and functional characteristics (Fig. 1)[2]. Understanding these reconstructions is key to controlling emergent phenomena in twisted vdW materials.

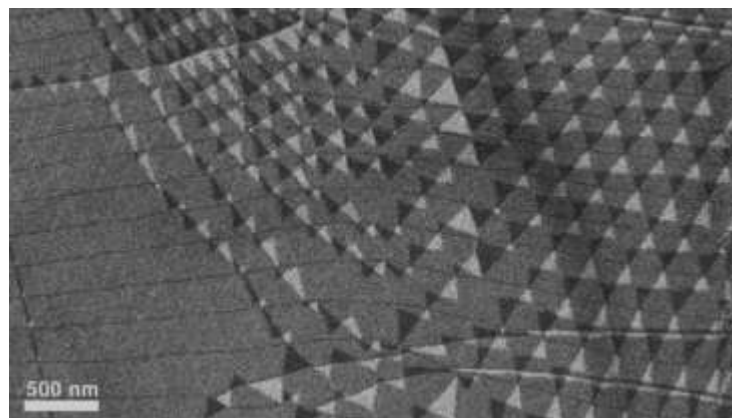
## References

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- [2] Daesung Park, Changwon Park, Kunihiro Yananose, Eunjung Ko, Byunghyun Kim, Rebecca Engelke, Xi Zhang, Konstantin Davydov, Matthew Green, Hyun-Mi Kim, Sang Hwa Park, Jae Heon Lee, Seul-Gi Kim, Hyeongkeun Kim, Kenji Watanabe, Takashi Taniguchi, Sang Mo Yang, Ke Wang, Philip Kim, Young-Woo Son, Hyobin Yoo, *Nature* 641, 8064 (2025) 896

## Figures

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**Figure 1:** Dark-field transmission electron microscopy image of domain tessellations in the moiré-of-moiré lattice of twisted trilayer graphene.