Abstract

Van der Waals layered materials offer unprecedented opportunities for atomic-scale engineering of heterostructures with suggested functionalities ranging from topological quantum computing to optoelectronics. Research has largely concentrated on beautiful assemblies of 2D materials into tailor-made low-dimensional heterostructures. Here, I will show how the combination of van der Waals layered materials with select organic semiconductors adds to the toolbox for creating novel heterostructures, and how new electronic properties with considerable potential for tailored functionalities may be obtained.

In order to expand the materials design toolbox, I will demonstrate how 3D layered materials can be made 2D by appropriate functionalization, paving the way for large-area low-dimensional heterostructures. Finally, I will discuss how seemingly 3D layered materials are in fact 2D on timescales of $10^{-15}$ s, providing the benefits of quantum confinement on short timescales.

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Oliver received his undergraduate degree at the Swiss Federal Institute of Technology in Zürich (ETH), before moving to the University of Oxford for his DPhil. After a postdoc at JILA in Boulder Colorado, he started his independent career at the University of Arizona in 2004. His research focuses on electronic structure, ultrafast dynamics, and quantum transport at interfaces. He holds the Homer C. and Emily Davis Weed Endowed Chair in Chemistry and a joint appointment in the Department of Physics.

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