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Van der Waals heterostructures for photodetection and light harvesting

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MoS_2 and transition metal dichalcogenides have opened numerous research directions and potential applications for this diverse family of nanomaterials. The combination of these 2D materials in heterostructures can result in a huge number of potentially interesting new materials. Most of the attention in this field is focused on heterostructures composed of different 2D materials. In my talk, I will present some of our recent efforts in this direction, oriented towards realizing combinations of 2D and 3D materials into van der Waals heterostructures. I will report on high-performance photodetectors based on 2D/3D heterostructures that can operate with internal gain and high sensitivity. Our devices also show very low noise, due to the unique architecture of the 2D/3D heterojunction. Next, I will give an update on our efforts to realize high-performance electrical circuits based on TMD materials.