# Towards scalable optoelectronic devices based on atomically thin materials.

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**Abstract:**
Materials that are just one- or a few-atom thick have emerged as an attractive option for low-power electronics and optoelectronics. This is due to their high mobility and to the flexibility that they offer in device design, allowing control of thermal management and energy dissipation in devices that are miniaturized to nanoscale dimensions. Several types of high-performance devices based on atomically thin materials have indeed already been demonstrated. However, most of them were fabricated using monolayer, single-crystal flakes exfoliated from bulk material, therefore scalability is still a crucial issue. In the past few years, there has been significant progress in the synthesis of large-area, high-quality monolayer materials, but the effect of their low crystallinity and of the defects created by processing on the performance of devices is still unclear. Here I will focus on optoelectronics applications and I will discuss our recent work on different types of photodetectors based on large-area monolayers of a gapless material, graphene [1-4], and a semiconducting material, molybdenum disulfide [5, 6]. We find that defects and adsorbates do play an important role in the detection mechanism, with the counterintuitive result that they can substantially enhance the device responsivity.

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