Device Integration of atomically precise Graphene Nanoribbons (GNRs)

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Graphene nanoribbons (GNRs) have attracted considerable interest due to their largely modifiable electronic properties, including width-dependent bandgaps for armchair GNRs and spin-polarized edge states for GNRs with zigzag edges [1,2,3,4]. Manifestation of these properties requires atomically precise GNRs, which can be achieved through a bottom-up synthesis approach under ultrahigh vacuum conditions. We show that 5-atom wide armchair GNRs as well as pyrene-GNRs can be processed under ambient conditions and incorporated as the active material in a field effect transistor [5,6]. At room temperature, a film like behavior is observed while at cryogenic temperatures coulomb blockade and single electron tunnelling can be seen. Our recent results may enable the realization of devices based on carbon nanomaterials with exotic quantum properties.

References

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Figures

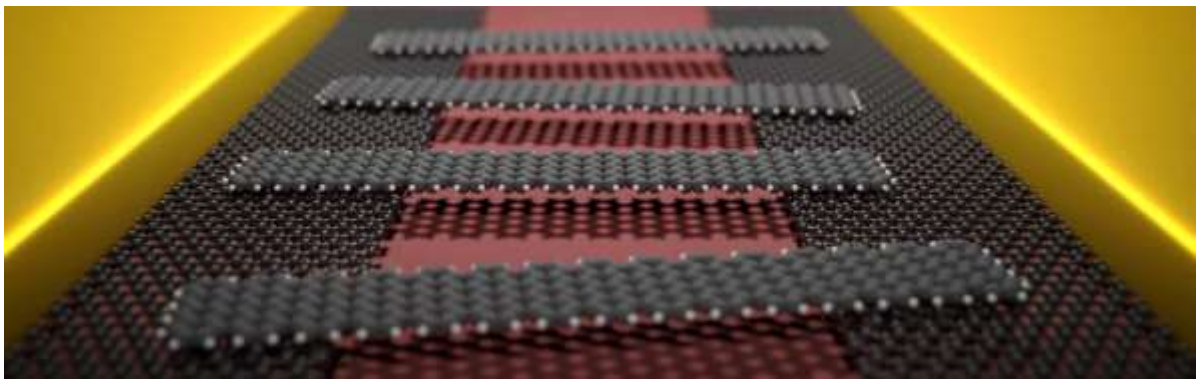

Figure 1: Artistic illustration of graphene nanoribbons integrated in a FET using graphene electrodes.