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Graphene and Graphene Nanoribbons

The key breakthrough is the synthesis of graphene nanoribbons (GNRs), quasi-1D-semiconductors, which emerge as unique carbon nanostructures and versatile materials for electronics, optics and energy technology. Their band structures can be widely tuned yielding semiconductors and even topological insulators. The most important features are i) the opening of a band gap due to the geometric confinement, a major difference from graphene, and ii) the occurrence of edge localized electronic states with spin polarization.

All characteristics offer new technological opportunities, for example, adding the spin degree of freedom to graphene-based circuitry or pushing the power density for energy storage in supercapacitors. Comparing materials performances of graphene and graphene nanoribbons is most revealing.