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Distinct Transport Properties of Mono-Layer and Bi-Layer Graphene Nanoribbons YU-MING LIN, ZHIHONG CHEN, PHAEDON AVOURIS, IBM T. J. Watson Res. Center — Graphene holds promise for future electronic applications owing to its exceptional carrier mobility and a Dirac-like, massless dispersion relation for charge carriers. Here we report on experimental studies of electrical transport properties of graphene nano-ribbon devices. Graphene nano-ribbons devices, consisting of mono-layer and bi-layer graphene, were fabricated by e-beam lithography and plasma etching process. These nano-ribbon devices exhibit size-dependent transport properties due to quantum confinement at low temperatures. We observed distinct transport behaviors for mono-layer and bi-layer devices, and this may be related to a tunable bandgap that can be induced in bi-layer graphene. In particular, in bi-layer devices, we observed a significantly lower noise level than that of single-layer graphene. These findings provide insight into the intrinsic noise mechanisms in graphene layers and also elucidate the impact of the coupling between the two layers in the bi-layer graphene on transport properties.

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