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Novel plasma catalytic reaction for structural-controlled growth of graphene and graphene nanoribbon

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An advanced plasma chemical vapor deposition (CVD) method has outstanding advantages for the structural-controlled growth and functionalization of carbon nanotubes (CNTs) [1,2] and graphene [3,4]. Graphene nanoribbons combine the unique electronic and spin properties of graphene with a transport gap. This makes them an attractive candidate material for the channels of next-generation transistors. However, the reliable site and alignment control of nanoribbons with high on/off current ratios remains a challenge. We have developed a new, simple, scalable method based on novel plasma catalytic reaction for directly fabricating narrow (23 nm) graphene nanoribbon devices with a clear transport gap (58.5 meV) and a high on/off ratio (10000). Indeed, graphene nanoribbons can be grown at any desired position on an insulating substrate without any post-growth treatment, and large-scale, two- and three dimensional integration of graphene nanoribbon devices should be realizable, thereby accelerating the practical evolution of graphene nanoribbon-based electrical applications [5].

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