FUNCTIONALIZATION OF EPITAXIALLY GROWN GRAPHENE NANOSTRUCTURES

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Functionalization of graphene is an essential task for any future carbon based electronics. In this respect graphene ribbons grown on pre-structured SiC(0001) surfaces are interesting as they exhibit promising transport properties. Graphene ribbons grown on pre-structured SiC(0001) surfaces exhibit promising transport properties, e.g. high temperature annealing of appropriately designed SiC-Mesa structures results in growth of sidewall nanoribbons revealing robust ballistic transport channels with mean free path lengths up to 16µm at 300K [1]. The existence of edge states on zig-zag oriented ribbons is confirmed by Raman, STM and STS measurements [2,3]. Moreover, by means of STM lithography, we have recently fabricated nano-constrictions within these wires revealing Fabry-Perot like resonance features [4].

Npn-structures with Klein tunneling barriers were realized by functionalizing the buffer layer on top of the SiC-mesas via Ge-intercalation. Depending on the local Ge coverage the chemical potential is either shifted above or below the Dirac point correlating nicely with the morphology as deduced from scanning tunneling microscopy and spectroscopy. The length of a single pn-junction is around 5 nm as revealed by spatially resolved STS measurements and therefore, significantly lower than those induced by field effects. In case of bipolar structures (npn and pnp) the resistance strongly depends on the inner barrier length D. For short barriers (D < 200 nm) the second junction appears almost transparent, a clear signature of Klein tunneling [5].

Keywords: graphene nanoribbons, ballistic transport, Klein tunneling, 4-tip STM SEM

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