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Epitaxial graphene on SiC(0001)

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Epitaxial graphene on SiC is considered to open a route towards graphene based electronics such as, e.g., high frequency transistors. Recently considerable progress has been made in the growth of epitaxial graphene on SiC. On the Si-face of SiC, where the growth is slower as compared to the C-face, monolayers can be grown reliably. However, several open questions remain. Transport studies as well es photoelectron spectroscopy has shown that the pristine layers on SiC(0001) are heavily electron doped ($n = 1 \times 10^{13}$ cm^{-1}). This results in rather low electron mobilities of the order of 2000 cm^2/Vs at 25 K. In addition, the carrier mobility shows a strong temperature dependence so that it drops to around 1000 cm^2/Vs at 300 K. In my presentation I will first show how chemical gating of graphene by deposition of F4TCNQ affects the carrier mobility. Hall effect measurements on samples close to charge neutrality show a carrier mobility of 29,000 cm^2/Vs at 25 K. Then I will discuss measurements demonstrating inertial-ballistic transport in nanoscale cross junctions fabricated from epitaxial graphene on SiC(0001). Finally, I will review recent results obtained by hydrogenation of the interface between graphene and SiC(0001). The latter process leads to a decoupling of the bufferlayer which is converted into quasi-freestanding graphene (QFMLG). The electronic, structural, and transport properties of QFMLG will be discussed in detail.