BERGISCHE UNIVERSITÄT WUPPERTAL

IfP
Institut für Polymertechnologie

From Single Graphene Transistors Towards Integrated Circuits

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High frequency transistors, the core of modern information and communication systems, have been recognized from the very beginning as one of the most promising fields of applications for graphene having the potential to significant outperform transistors based on Silicon and III/V semiconductors in terms of speed. This expectation has mainly been fuelled by graphene's outstanding charge carrier mobility, the large saturation velocity and the 2D nature giving prospects for ultimately scaled devices. Although single graphene field effect transistors (GFETs) have already proven these expectations by delivering high cut-off frequencies up to 420GHz, the realization of integrated circuits based on graphene transistors is still in its embryonic stage. To date the most complex integrated circuit based on GFETs are a mixers containing one GFET and passive components operating at GHz frequencies and an inverter operating at kHz frequency and consisting of one p and one n type GFET. However the realization of more complex circuits would be an essential step towards the success of graphene in real electronic applications.
After a more broader introduction to graphene I will review in this talk the current state-of-the-art for graphene field effect transistors in order to point out possibilities and challenges of GFETs for future electronic devices. Based on single device performance possibilities for realizing integrated circuits will be shown starting from simple circuits like voltage amplifiers, mixers or inverters. The performance of these circuits will be assessed towards latest technologies and possible routes for optimizing those circuits will be discussed. A special focus will be put on applications in the field of plastic electronic applications.