Graphene-based Electronics and Optoelectronics

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Graphene a two-dimensional, single atomic layer material with linear electron dispersion has rather unique electrical and properties[1]. There is currently strong interest in taking advantage of these properties for technological applications[2]. In my talk I will review the key properties of graphene, how these are affected by environmental interactions and how they can be utilized in electronics and optoelectronics.

Specifically, I will discuss high frequency (>100 GHz) graphene transistors[3], their fabrication and operation, as well as related device physics aspects, such as transport mechanisms, contacts, temperature effects, dissipation, etc. Simple integrated graphene circuits will also be presented. I will then discuss key optical properties of graphene and how they can be combined with its excellent electrical properties and used in optoelectronics applications. Specific examples involving ultrafast graphene photodetectors[5] and their applications in optical data detection[6] will be presented.

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[4] Xia, F.; Mueller, T.; Lin, Y.-M.; Valdes-Garcia, A.; Avouris, Ph. *Nature Nano* 4, 839 (2009)**.**
[5] Mueller, T.; Xia, F.; Avouris, Ph. *Nature Photon.* 4, 297 (2010).