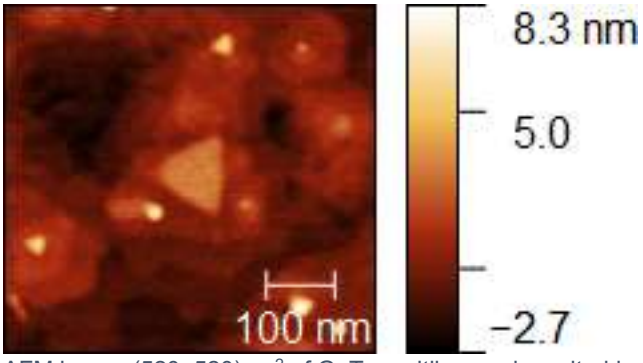
MSc thesis topic “Electro-tunable GaTe/Graphene devices”

Following the discovery of graphene, a wide variety of 2D materials have emerged that open up entirely new directions in nanoscience [1]. In particular, devices formed from atomically thin materials are highly promising for flexible and transparent opto-electronics that go far beyond the capability of conventional films due to the high surface area and the unique response to external fields [2]. This project aims at investigating the optical and electronic properties of a new material system by combining graphene and ultrapure few layer GaTe crystals, an emergent monochalcogenide 2D material obtained by molecular beam epitaxy and characterized by a quasi-flat band dispersion [3].

In this project you will develop the nanofabrication of the electro tunable GaTe/Graphene devices and probe the electro-optical properties of GaTe as a function of charge concentration and layer thickness. You will engineer and manipulate the interband transitions and investigate them using optical characterization and quantum transport techniques at cryogenic temperatures. Hereby, you will learn about the key nanofabrication methods applied to 2D layered materials, discover optical and electrical spectroscopy methods at low temperatures and enter the research field of 2D materials.

We are seeking highly motivated, hardworking students with an inclination for technical and optical lab work. Some experience with optical spectroscopy, electronics, 2D materials and cleanroom fabrication will be beneficial but not essential.

If you are interested to become part of our research team, please send your CV, transcript of your records and Bachelor thesis to Dr. Eugenio Zallo (eugenio.zallo@wsi.tum.de) and Prof. Jonathan J. Finley (finley@wsi.tum.de).



AFM image (520×520)nm^2 of GaTe multilayers deposited by Molecular Beam Epitaxy on Graphene/SiC substrates.

[1] Y. Cao, et al., Nature 555 (2018) 43-50, 80-84
[2] D. Akinwande, et al., Nat. Comm. 5 (2014) 5678
[3] V. Zólyomi et al., Phys. Rev. B, 87 (2013) 195403