FNM 2016 Program Committee cordially invites people to submit abstracts for The International Workshop on Functional and Nanostructured Materials to be held in Tbilisi, Georgia 6th -10th September 2016.

# THz emitters based on Schottky potentials and diffusion currents

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In the Terahertz laboratories group we work on novel THz emitters based on the lateral Photo-Dember (LPD) effect. Terahertz (THz) radiation can be generated by ultrafast photo-excitation of carriers in a semiconductor partly masked by a gold surface. A simulation of the effect taking into account the diffusion of carriers and the electric field shows that the THz emission arises not only from the diffusion current but also because the metal inhibits the radiation from part of the dipole population, thus creating an asymmetry and therefore a net current[1,2]. Experimental investigations confirm the simulations and show how that metal-mask dipole inhibition can be used to create THz emitters. A multiplexed emitter geometry will also be shown where a metallic grating is deposited on top of GaAs and a micro-array cylindrical lens is used for its illumination. Then, double-metallic multiple emitters will be presented that operate under uniform illumination eliminating the need for a micro-lens array and are fabricated with periodic Au and Pb structures on GaAs. Terahertz emission in this case originates from the lateral photo-Dember effect and from the different Schottky barrier heights of the chosen metal pair. We characterize the emitters at different temperatures and fluences and determine that most terahertz emission at 300 K is due to band-bending from the Schottky barrier of the metal[3]. The double metallic waveguides can be large area and thus can be used in order to focus or steer the THz beam if the optical excitation is spatially moldulated in phase, amplitude or both. This can be used for fast THz beam steering which can have applications in THz imaging.

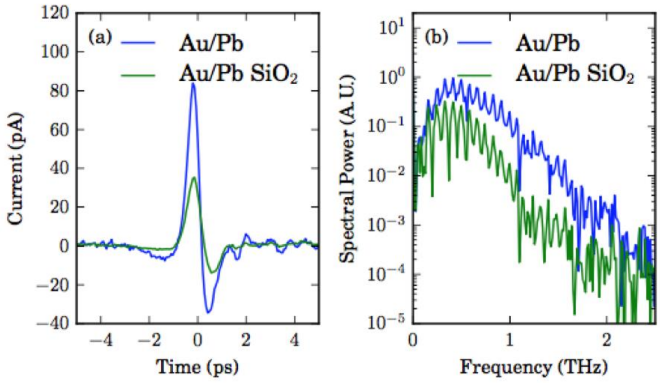


Figure 1. THz-TDS scans for both the SiO2 insulated and the uninsulated Au/Pb emitters patterned on SI-GaAs. (a) shows the time domain scans whilst (b) shows the relating Fourier transfroms. With an SiO2 layer the Schottky effects are eliminated, reducing the THz power output by more than half and showing the Schottky barrier plays a much greater role in DM emitters than observed in single edge LPD emitters.

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