“Terahertz field-driven nonlinearities in optical media and light-sound conversion in 3D graphene sponge”

Recent progress of Terahertz sources towards higher peak power offers new opportunities in science to control nonlinear properties of matter on an ultrafast timescale. In this talk I will present such an interaction in GaP and diamond leading to extreme modification of the polarization and spectral properties of a co-propagating optical beam [1,2].
In the second part I will discuss a new approach for light-sound conversion in a recently developed 3D graphene sponge through a photo-thermoacoustic mechanism. The unique combination of mechanical, optical, and thermodynamic properties of graphene assembled in a 3D sponge structure are shown to result in an unprecedented high conversion efficiency independent of light wavelength from infrared to ultraviolet. Based on these findings I will discuss a photo-thermal based graphene sponge loudspeaker, providing a full digital operation for frequencies from acoustic to ultrasound [3].

[1] M. Shalaby, C. Vicario, C.P. Hauri **APL Photonics** 2, 036106 (2017)
[2] C. Vicario, M. Shalaby, C.P. Hauri **Phys. Rev. Lett.** 118, 083901 (2017)
[3] F. Giorgianni, C. Vicario, M. Shalaby, L.D. Tenuzzo, A. Marcelli, T. Zhang, K. Zhao, Y. Chen, C.P. Hauri, S. Lupi, **Adv. Funct. Mater.** 28*, 1702652 (*2017*)* https://doi.org/10.1002/adfm.201702652