Università degli Studi di Padova ***Dipartimento di Scienze Chimiche***

Giovedì 2 febbraio, alle ore 15.00, presso l'Aula G
del Centro Interchimico, via Marzolo 1

la ***Dr. Stefania Pagliara***

Interdisciplinary Laboratories for Advanced Materials Physics (i-LAMP)
and Dipartimento di Matematica e Fisica,
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terrà un seminario dal titolo:

Irradiating Graphite With Ultra-Violet Femtosecond Laser Pulses

The advent of ultrashort, high intensity coherent pulses in the near-IR, visible and near-UV ranges has allowed to investigate the possibility of shaping the physical properties of a material through light irradiation on an extremely short timescale. The challenging mechanisms at the origin of this phenomenon rely on the fact that when an intense femtosecond laser pulse is absorbed by a solid, the electrons and the lattice are driven out of equilibrium and both screening effects and rearrangement of the lattice occur, because of the excitation of a large fraction of the valence electrons to the conduction band.

Recently, time resolved spectroscopies have shown that intense infrared (IR) femtosecond laser pulses can induce significant structural changes in graphite, due to the favorable coupling of the photoexcited carriers with a subset of high energy optical phonons (i.e., strongly-coupled-optical-phonons, SCOP). However, because of the peculiar electronic structure of graphite, new surprising effects are revealed by exciting graphite with ultrashort coherent pulses in the ultraviolet (UV) spectral region.

By transient reflectivity measurements (in a pump-probe experimental set-up), we have demonstrated that when an UV-ultrashort optical pump excites about $2x10^{21}$ electrons/cm^3 across the $\pi-\pi^*$ band gap near the M point of the Brillouin zone, significant variations of the graphite optical properties occur. This transient change of the dielectric function takes place within 150 fs of the pump-pulse excitation and is consistent with a 500 meV gap renormalization of the π bands.

Moreover, by using non-linear angle-resolved photoemission spectroscopy, we show that femtosecond ultraviolet laser pulses are also able to generate a significant electronic charge, supported by the image potential states, above the graphite surface. The rising of this transient bi-dimensional electron gas is favored by the onset of a strong light-induced interaction between the π bands and the image potential states. This discovery paves the way for exploring new photo-chemical processes at the graphite surface.

- S. Pagliara et al. *"Photoinduced $\pi-\pi^*$ band gap renormalization in graphite"*, JACS 2011, 133, 6318.

La presenza della S. V. sarà molto gradita

Il Direttore del Dipartimento
Prof. Paolo Scrimin

Prof. Mauro Sambi