Femtosecond laser ablation: as fun as it gets

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Target irradiation with a femtosecond laser adds to all the excitement of working with nanosecond excitation, the amusement of the ultra-short regime: plasmas are tinier, the emission is lower, the power densities are huge and the laser-matter interaction is so peculiar that new phenomena can be observed. The talk will provide an overview of different experiments performed on solid samples under femtosecond irradiation (800-nm, 35-fs) above the plasma formation threshold. Once the plasma is formed, the ions or photons emitted are used to determine the composition of the samples, performing fundamental studies on fragmentation and some other of interest. A comparison with similar performed on the nanosecond regime will be commented as well. An important aspect of our research is related to the timeline of the laser-matter interaction and how the target evolves up to the phase-explosion and plasma formation. Thus, pump-probe phase-change microscopy has been included within the arsenal of time-resolved techniques available. With our current set-up, time resolution in the order of 100 fs is attainable up to 3 ns after laser arrival, allowing the recording of images covering different aspects of laser-matter interaction as the formation of the free-electrons plasma and the formation of Newton rings that evolve at supersonic speeds. Taking advantage of the pump-probe set-up, fast spectroscopy has been done, being able to capture events with picosecond resolution. With such resolution, the dilemma of the time-scale where CN formation occurs in molecules containing or not C-N bonds has been faced.