Differential laser-matter interaction in the ablation of solid samples with laser pulses in the interval between 35 fs – 4 ps.

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Our communication is focused on the influence of the pulse width in the laser-matter interaction during laser ablation of solid materials. The experiments were performed with an 80 MHz, 100 nJ, 400 fs Ti-Saphire oscillator, amplified to produce an output of 3,5 mJ at 35 fs and a maximum repletion rate of 1 KHz. Modifications in the stretcher-compressor have allowed the continuous selection of amplified pulses in the range between 35 fs to 4 ps. The pulses are subjected to measurements in the autocorrelation, spectral bandwidth and energy per pulse. A 0.5 m focal-length spectrograph fitted with an intensified CCD or fast single-channel detectors is used to determine the time constants, to establish the fluence threshold, and to record multi-channel spectra from the generated plasmas. Additionally, morphological characterization making use of optical and electron microscopy were performed.

The effect of the longer laser pulses in the laser-matter interaction - particularly in the extension of the heat-affected zone - and its implication in depth-profiling studies was also checked. For such purpose, a layered sample with a defined structure was analyzed by laser-induced breakdown spectroscopy under different pulse widths conditions. The effect on the averaged ablation rate, depth resolution and layer mixing will be commented.