A “quick look” at ultrafast ablation using fs-resolved phase-change microscopy

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Ultrashort laser ablation opens new possibilities due to the significantly different properties when compared with their nanosecond counterpart. The most relevant is due to the lack of interaction between the incoming laser beam and the expanding plasma what allows the visualization of the different phenomena occurring until mass transfer occurs. The present communication details the design, construction and evaluation of a microscope with time-resolved imaging capabilities. With such instrument, femtosecond-resolved micrographies of the surface of samples exposed to ultrashort laser pulses are obtained, allowing the dynamic observation of the phase-change during subthreshold laser-matter interaction. The results obtained are in the basis of the physics governing the ablation process and are in close contact with analytical techniques as LIBS, LIMS, MALDI or LA-ICP. The results presented demonstrates the appearance of dynamic Newton rings (see figure inserted) at the surface of the sample that corresponds to the formation of a thin laser-induced surface layer resulting in constructive and destructive interference of the light reflected from the surface with the light reflected from the layer interface.