

DLIP patterning of Ge at two time scales (ns and fs)

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Fast and ultrafast laser pulses are widely employed for material micro- and nano-structuring. Direct laser interference patterning (DLIP) is a more than suitable technique for periodic micro-patterning due to the precise and controlled energy deposition through the interference of two or more laser beams, allowing the fabrication of a wide range of structures in diverse materials [1].

Here, we present results of DLIP patterning in Ge upon ns and fs laser pulses, exploring the amorphization process and surface deformation mechanisms. For that purpose, we employed a Ti:Sapphire laser system (800 nm, 120 fs or 8 ns) in a 2 laser beam configuration. We studied the final topography of the patterned spots for different DLIP line periods from 5.00 μm down to 1.25 μm for both pulse durations. Results of atomic force microscopy (AFM) measurements can be seen in **Figure 1**. Particularly, for the 2.5 μm period (**Figure 1 c**) the topography with ns pulses performs two extra depressions at the edges with respect to the modification with fs pulses. For the lowest period (**Figure 1 d**) it is observed that where elevations are formed in the ns regime, in the fs regime they are depressions and viceversa. These differences could be attributed to the different melt duration in each case, affecting the hydrodynamic mechanisms responsible for surface modification as Marangoni convection, capillary waves and resolidification [2].

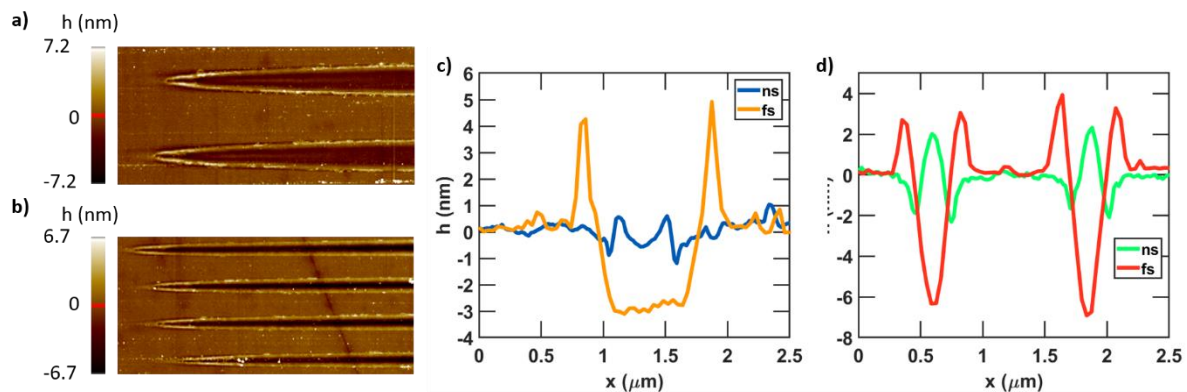


Figure 1: AFM topography maps of fs-DLIP (a-b) with different periods: 2.50 μm (a) and 1.25 μm (b). Topography profiles along a vertical line for 2.50 μm period (c) and 1.25 μm period (d). Blue and green correspond to ns-DLIP and orange and red lines to fs-DLIP.

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