Fundamental investigations of metal matrix composite ablation using burst pulses

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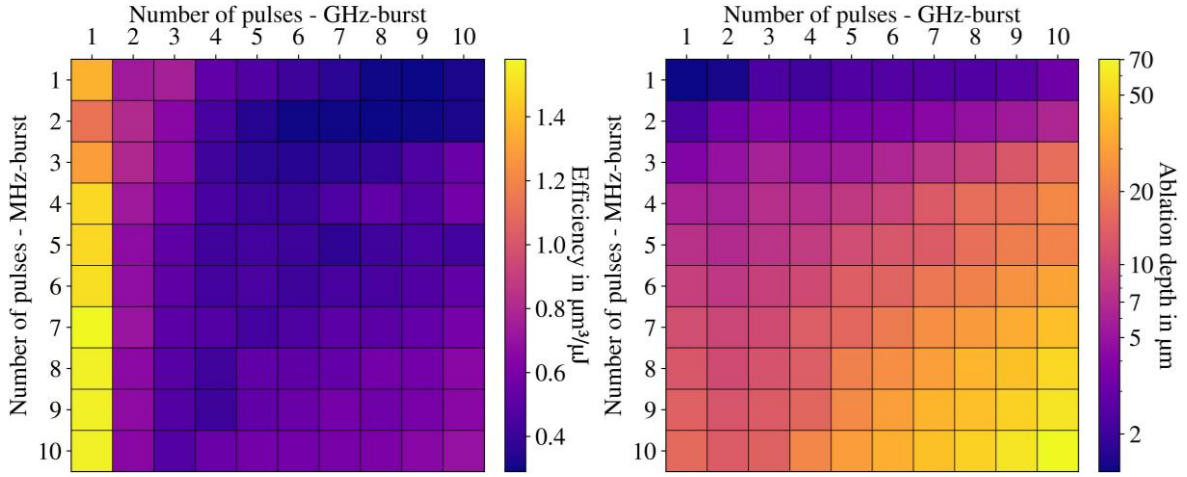
Bursts of ultrashort pulses with intra-burst rates in the MHz range have been reported to be highly efficient for the ablation of metals [1], metal matrix composites [2] and semiconductors [3] compared to single pulses. In contrast, when bursts with intra-burst rates in the GHz range and fluences above the ablation threshold where used, a significant decrease in efficiency was observed, which can be attributed to shielding by the presence of a high-intensity plasma [4]. The combination of the two burst modes can be used for the selective re-melting of the metal matrix composite surface and thus for the selective adjustment of the topography [5]. In this study, the authors report on the ablation of cemented tungsten carbide with a burst-mode solid-state laser source using the three burst modes mentioned. Ablation areas were generated as a function of the fluence and the number of ultrashort pulses per burst. The results confirm that a proper combination of different burst and process parameters can be used to achieve an optimum interplay of productivity, efficiency, and roughness with a significant influence on the topography of the irradiated cemented tungsten carbide surface.



Efficiency and ablation depth with different burst parameters, a fluence of 0.5 J/cm² per burst pulse and 5 passes.

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