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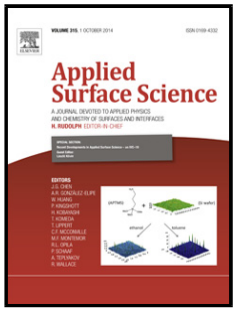

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Laser-induced periodic surface structures on fused silica upon cross-polarized two-color double-fs-pulse irradiation

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Abstract

The dynamics of the formation of laser-induced periodic surface structures (LIPSS) on fused silica upon irradiation with linearly polarized fs-laser pulses (50 fs pulse duration) is studied by cross-polarized two-color double-fs-pulse experiments. In order to analyze the relevance of temporally distributed energy deposition in the early stage of LIPSS formation, a Mach-Zehnder interferometer was used for generating multiple double-pulse sequences at two different wavelengths (400 & 800 nm). The inter-pulse delay between the individual cross-polarized pulses of each sequence was systematically varied in the sub-ps range and the resulting LIPSS morphologies were characterized by scanning electron microscopy. It is found that the polarization of the first laser pulse arriving to the surface determines the orientation and the periodicity of the LIPSS. These two-color experiments further confirm the importance of the ultrafast energy deposition to the silica surface for LIPSS formation, particularly by the first laser pulse of each sequence. The second laser pulse subsequently reinforces the previously seeded spatial LIPSS characteristics (period, orientation).

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