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Titel: Stress based figure modification of glass substrates

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Abstract:

The possibility to deform substrates in a targeted manner is highly relevant in fields like astronomical optics and semiconductor technology. Space telescopes, for example, have strict specifications regarding their weight, so thin and thus light mirrors are desirable. However, coatings induce mechanical stress between the substrate and the film, which leads to unwanted deformation especially of such thin substrates. The aim of this work is to use laser irradiation to induce mechanical stresses in glass substrates that deform them in a controlled manner and correct unwanted deformations. The curvature behavior of the commercial glass Schott D263T is investigated by introducing stresses on the surface of the substrate

by irradiation with an ArF-Excimer laser with wavelength $\lambda = 193$ nm. The introduction of stresses is based on the temperature gradient mechanism. The material at the surface is melted, expands and contracts during solidification, resulting in tensile stress.

In analogy to the common theories of sample deformation by continuous and patterned films, I demonstrate the introduction of stresses by laser irradiation and the resulting shape change.