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Femtosecond laser-induced modifications of frequency tripling mirrors

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It is well known that dielectric materials change their properties during irradiation by (high-power) lasers. While in some cases this is desirable and used for laser conditioning, in many cases these material modifications need to be avoided or minimized to maintain the function of optical elements, like mirrors and beam splitters.

Recently dielectric stacks have been proposed as nonlinear optical elements for frequency conversion and switches. These dielectric multi-layer coatings are exposed to large incident intensities, which may lead to permanent refractive index changes. We characterize material modifications of a frequency tripling mirror to assess their impact on conversion efficiency and to suggest mitigation measures.