

Nanoscale investigation of multilayer, dispersive mirrors damage by spectroscopic near-field microscopy

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Multilayer dielectric mirrors are the limiting factor to scale up and simplify high-power femtosecond laser systems towards shorter pulse durations and higher average or peak powers. Detailed characterization including laser-induced damage is pursued by using nano-FTIR, which features strong material contrast at lateral resolution of only 20 nm. The high sensitivity of chemical recognition is due to phonon resonance of the constituent layers. For the investigated mirror these are TaO₅ and SiO₂ showing resonances at 680 and 1050 cm⁻¹, respectively. Using 30 fs pulses we observe two different damage mechanisms.

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