UltraFast Innovations

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Application note: dispersive mirrors with reduced thermal lensing

In recent years ultrafast high-energy oscillators and amplifiers have become ubiquitous in research labs as well as in a number of industrial applications. Dispersive mirrors (DM) constitute one of the key components of these systems, with their performance significantly affecting that of the laser. While theoretical limitations of the maximal achievable pulse energy from mode-locked oscillators are not yet reached, their limitations are originating from the experimental and technical side. One of the major ones being thermal effects in the intra-cavity optics, especially dispersive mirrors.

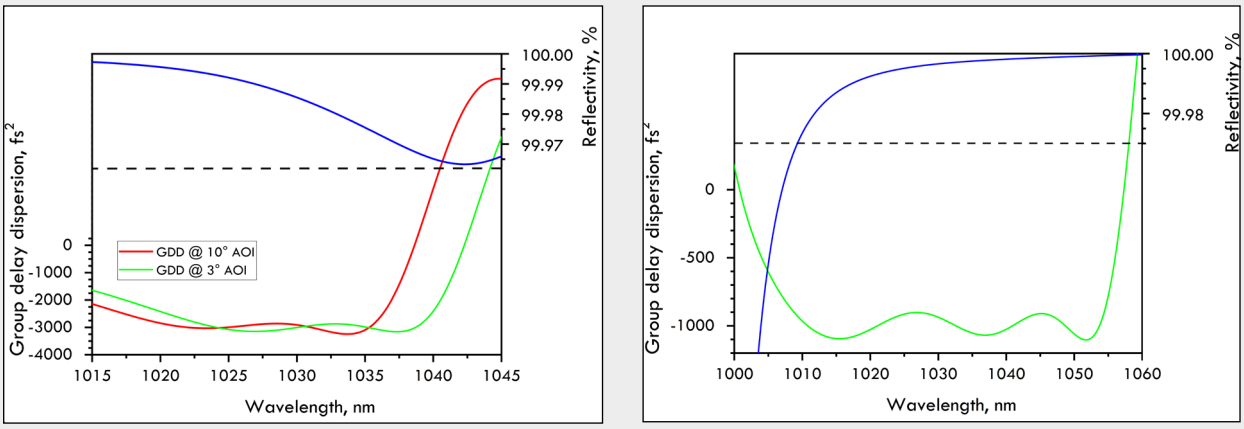
In order to address the pending issue and benefitting from recent advances in dispersive multilayer mirror technology and extensive experience, Ultrafast Innovations GmbH has released a family of high dispersion, low losses mirrors with negligible thermal effects: HD73 and HD64.

The novel HDM have been successfully applied for power-scalable Kerr-lens modelocking of an Yb:YAG thin-disk laser [1].

Analysis of surface temperature changes of the developed mirrors reveals that both designs demonstrate relatively low surface temperature maxima of ~314 K in an operating Kerr-lens mode-locked oscillator compared to the 298 K with no lasing and >380 K for the "usual" HDMs. The high-reflectance mirror (quarter-wave stack) made from the same alternating materials as HDM has maximum temperature of 312 K.

Key Product Features of HD73 & HD64

- Spectral coverage @1030 nm
- Averaged reflectance > 99.95%
- Averaged GDD of -3000 fs² (HD73) and -1000 fs² (HD64)



HDM with low thermal lensing. Right: HD73 Left: HD64

References:

[1] O. Pronin, J. Brons, C. Grasse, V. Pervak, G. Boehm, M.-C. Amann, V. L. Kalashnikov, A.Apolonski, and F. Krausz, "High-power 200 fs Kerr-lens mode-locked Yb:YAG thin-disk oscillator," Opt. Lett. ***36****(24), 4746–4748 (2011).*

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