UltraFast Innovations

YOUR KEY to innovation and success

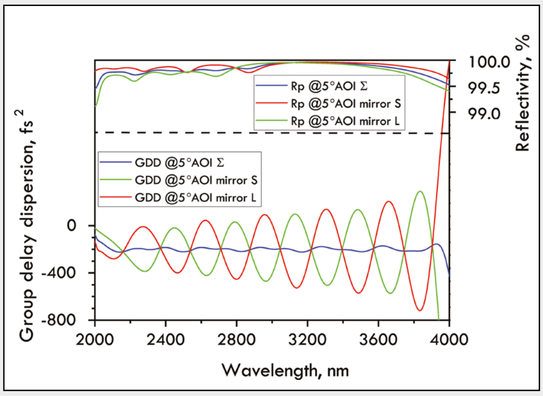
Infrared dispersive optics

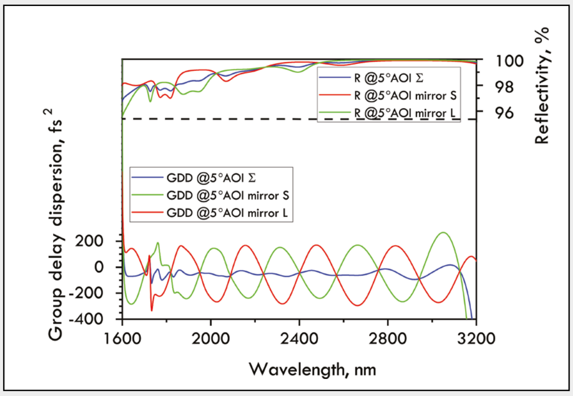
The dispersive mirror (DM) technology has become already well-established in the systems based on Ti:Sa lasers (~800 nm) and near-infrared Yb:YAG lasers (~1030 nm). Recently, the interest has been broadened to thulium and holmium-based lasers systems operating around 2 µm [1], as well as a novel technology based on 2.4 µm chromium doped zinc sulfide (Cr:ZnS) or chromium doped zinc selenide (Cr:ZnSe) extending the laser output to 3.2 µm [2]. In order to further develop this technology, dispersive mirrors in the infrared spectral range 1.6-4 µm are strongly demanded [3,4].
Ultrafast Innovations has extended its portfolio of dispersive infrared optics now offering mirrors with positive and negative group-delay dispersion (GDD), as well as mirrors with non-zero third order dispersion (TOD). Si/SiO2 material pair is used for production of our IR dispersive optics.
Thanks to our optimized deposition process, the mirrors exhibit reduced O-H absorption around 2.7 µm mounting to below 1% losses in the range from 2.8 µm to 2.9 µm.

Key Product Features:

- Spectral range from 1.6 µm up to 4 µm
- Reflectance › 99% per bounce (›99.8% at 2.7 µm)
- Diverse dispersive properties: positive and negative GDD compensation w/wo TOD possible
- Custom substrate shapes and sizes on request
- Extended portfolio of products

Ultra-broadband IR optics:





Broadband infrared dispersive mirrors CM1851 (left) and CM1953 (right) [3, 4].

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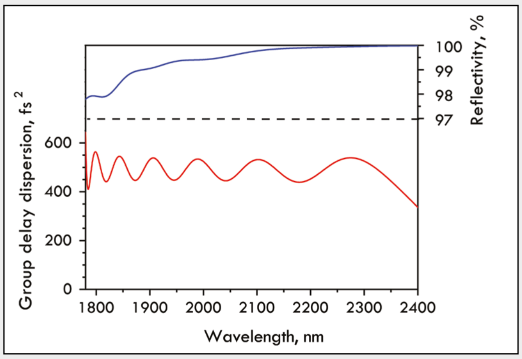
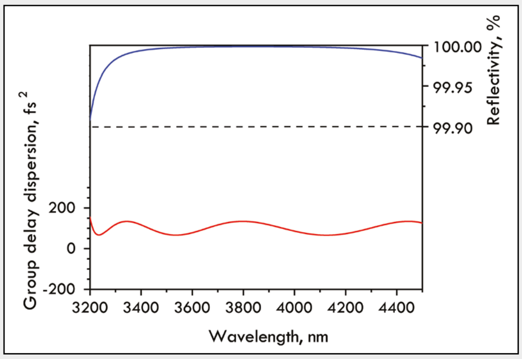
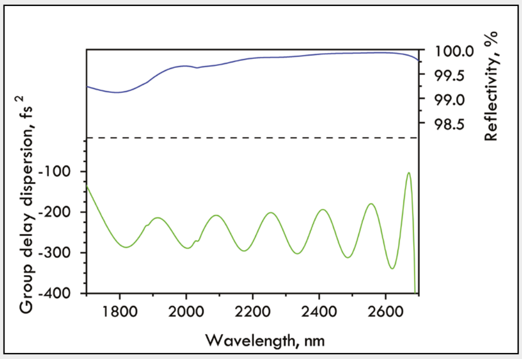
IR optics with positive GDD:

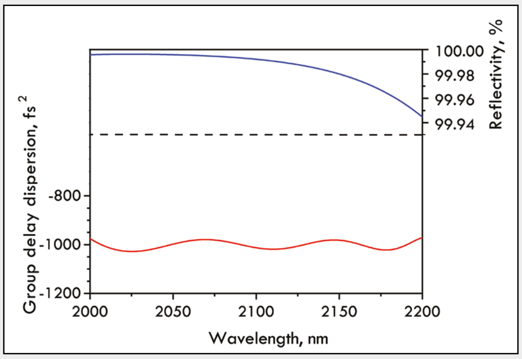




Infrared dispersive mirrors with positive GDD: IR1402 (left) and HD1715 (right).

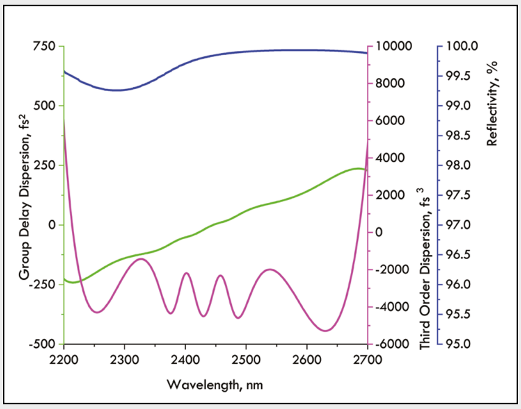
IR optics with negative GDD:

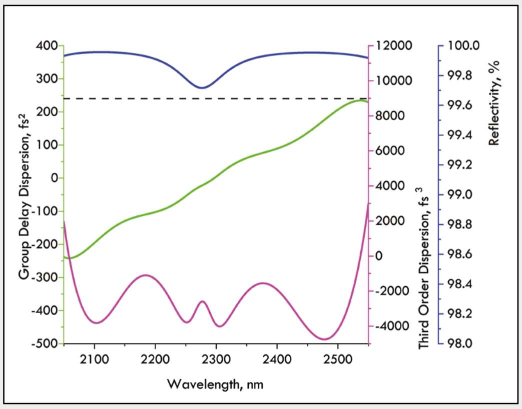




Infrared dispersive mirrors with negative GDD: PC1741 (left) and HD1501 (right).

IR optics with TOD:





Infrared dispersive mirrors with TOD: IR1304_RC2 (left) and TOD1601 (right).

References:

*[1] K. Yang, et al., "Passively mode-locked Tm, Ho:YAG laser at 2 µm based on saturable absorption of inter subband transitions in quantum wells," Opt. Express **18**(7), 6537 (2010).*

*[2] I. T. Sorokina and E. Sorokin, "Femtosecond Cr2+ based lasers," IEEE J. Sel. Top. Quantum Electron. **21**(1), 273–291(2015).*

*[3] V. Pervak, T. Amotchkina, Q.Wang, O. Pronin, K. F. Mak, and M. Trubetskov, "2/3 octave Si/SiO2 infrared dispersive mirrors open new horizons in ultrafast multilayer optics," Opt. Express **27**(1), 55 (2019).*

*[4] V. Pervak, et al., "Complementary Si/SiO2 dispersive mirrors for 2-4 µm spectral range," Opt. Express **27**(24), 34901 (2019).*