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TYDEX: Optics for THz Photonics

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Nowadays interest to THz radiation is growing fast. Many different disciplines such as ultra fast spectroscopy, semiconductor device fabrication, and bio-medical imaging involve the recent development of THz technology. The THz research activities have mainly focused on generation and detection until lately, but the focal point has shifted to the practical applications such as high-speed communication, molecular spectroscopy, security imaging, and medical diagnosis, among many others.

Research and industrial applications require availability of good tool base. To satisfy needs of THz photonics TYDEX develops and produces a wide range of optics. Offered products can be divided into three groups:

- Passive components (lenses, windows, prisms, mirrors, splitters, and waveplates);
- Built up components (low pass and band pass filters, polarizers, and attenuators);
- Devices (Golay Detectors with hardware-software complex).

Crystalline materials (high-resistivity float zone silicon (HRFZ-Si), crystal quartz and sapphire) as well as polymer ones (polymethylpentene (TPX) and high-density polyethylene (HDPE)) are used for components manufacturing.

TYDEX offers lenses of different shapes: meniscus, hyper-/hypo-/hemispherical, bullet, and plano-cylindrical ones made of HRFZ-Si as well as plano-convex and bi-convex lenses of TPX. Windows (plano-plano and wedged) are produced of any material mentioned above. AR coatings are available for HRFZ-Si and crystal quartz optics. TYDEX manufactures HRFZ-Si prisms of the following configurations: right angle and attenuated total reflectance ones. Also TYDEX produces splitters for applications where NIR or MIR radiation has to be reflected without transmission degradation in THz range. Mirrors for full reflection of THz beam are offered too. TYDEX supplies monochromatic $\lambda/2$ and $\lambda/4$ waveplates for different operating wavelengths.

Besides conventional polymer and crystalline optics TYDEX manufactures low pass and band pass filters, polarizers and attenuators. Low pass filters are intended to block radiation from 0.2 μm to 13-100 μm and to transmit at longer wavelengths, and band pass ones – to pass radiation within the range 20-3000 μm . To polarize radiation from 7 μm to MM waves TYDEX offers polyethylene polarizers. Set of attenuators is used for attenuation of high-power THz radiation. It allows obtaining different attenuation levels (transmission is varied from 30% to 0.001%).

TYDEX supplies one of the most efficient detecting devices - Golay Cell. Three models of Golay Cells are available:

- GC-1P - Golay Detector with HDPE window is intended for monitoring and control of MIR and THz radiation;
- GC-1T - Golay Detector with TPX window – for detection of UV-NIR and THz radiation;
- GC-1D - Golay Detector with Diamond window – for registration of VIS-THz radiation.

Also TYDEX offers hardware-software complex for Golay detector operation with PC. It is served for detecting, processing and analyzing optoacoustical detector signals.

Other THz built up components and devices are in progress.