

Optoelectronic Technologies Division

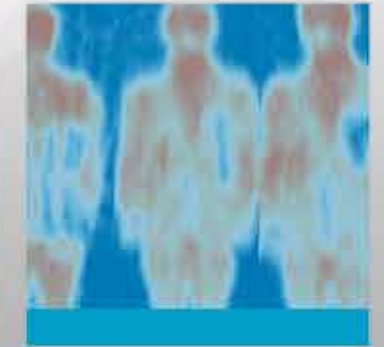
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Optoelectronic Technologies Division

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The Optoelectronic Technologies Division conducts fundamental and application studies related to the development of optoelectronic materials and technologies for applications in security systems, defence, environmental protection, medicine, and industry. The division is involved in the advanced construction and implementation of complex optoelectronic systems and devices including systems of point and remote detection of hazardous chemicals and biological materials. Fundamental studies carried out in the division mainly involve materials and nanomaterials engineering, optical spectroscopy, materials characterization using advanced research methods, plasmonics, and biotechnology.

RESEARCH

The scientific projects in the Optoelectronic Technologies Division are carried out in the following research areas:

- Physics and optics of new types of lasers, in particular those with potential applications in military laser technology systems
- Coherent and incoherent optical detection
- Design of refractive, reflective, and diffractive optical systems

- Optical beam shaping
- Integration of military optoelectronic systems
- Measurement methods and standards for calibration, testing, and standardization of military optoelectronic equipment
- Spectroscopy methods for remote detection of atmospheric pollutants and contaminants, including chemicals and biological materials
- Optical point and stand-off detection of biological and chemical agents
- Laser range-finding
- Measurement of laser speed
- Laser-plasma ion sources for nanotechnology and materials research
- Laser-assisted fabrication of thin films and nanostructures using a pulsed laser deposition (PLD) method
- Thin film technologies
- Plasmonic nanostructures for use in the detection of chemicals and biological materials
- Spectroscopy in the UV-Vis-NIR range, Raman, Surface Enhanced Raman Scattering, and fluorescence spectroscopies
- Biomaterials

- Analytical procedures for determination of microelements and biologically active compound content in various samples
- Cancer therapies and diagnostics.

ACHIEVEMENTS

Many optoelectronic devices and systems have been developed in the Optoelectronic Technologies Division and put into production. These include:

- LIDARs for stand-off detection of chemical and biological agents
- Laser rangefinders
- Laser speedometers
- Laser shooting and ballistic simulation systems
- Fire detection and explosion suppression systems
- Optoelectronics for fire control
- Laser communication links
- UV dosimeters
- UV Solar Blind radiometers
- Laser radiation warning systems
- Optoelectronic solutions for cancer diagnosis

RESEARCH FACILITIES

The laboratories of the Optoelectronic Technologies Division are equipped with high quality scientific equipment including:

- Mounting apparatus for optical and semiconductor structures with an accuracy of 3 μm
- X-ray photoelectron spectrometer
- Atomic absorption spectrometer
- FTIR, UV-VIS-IR, Raman and Fluorescence spectrometers
- Atomic force microscope – Raman microscope system
- Optical microscopes
- PLD systems with excimer lasers
- Vacuum evaporators (Physical Vapour Deposition)
- BIRAL systems for measuring the distribution of diameters, the level of fluorescence, and the shape of biological aerosol particles
- Gas analysis system with quantum cascade lasers
- LIDAR systems including Doppler, scattering, and fluorescence systems

RESEARCH GROUPS

- Optical Technologies Group
- Laser Teledetection Group
- Optical Spectroscopy Group
- Laser Nanotechnology Group
- Biochemistry Group



Speedometer



Stopfire system



Lidar systems

Laser rangefinder module



AFM-Raman system



Fabrication of plasmonic nanostructures by PVD