2010

National projects

- **"Development of New Structures and Methods for Optical Sensors" (GLRS)** (2010‑2011), funded by Research Council of Lithuania, No. MIP-80/2010

The prototype of automated spectroscopic setup was developed and sub-wavelength periodical structures possessing highest sensitivity were fabricated and investigated. Applying UV contact lithography, laser beam interference lithography and thin film deposition technologies including metallic film deposition, amorphous diamond like carbon deposition different period and micro-relief diffraction gratings were fabricated. Properties of the fabricated structures were investigated.

Publications:

• Tamulevičius, Tomas; Šeperys, Rimas; Andrulevičius, Mindaugas; Tamulevičius, Sigitas. Total internal reflection based sub-wavelength grating sensor for the determination of refractive index of liquids // Photonics and Nanostructures – Fundamentals and Applications. Amsterdam: Elsevier Science B.V. ISSN 1569-4410. 2011, Vol. 9, iss. 2, p. 140–148. [ISI Web of Science]. [IF (SCIE): 1,681 (2011)].

• Tamulevičius, Tomas; Šeperys, Rimas; Andrulevičius, Mindaugas; Kopustinskas, Vitoldas; Meškinis, Šarūnas; Tamulevičius, Sigitas. Refractive index sensor based on the diamond like carbon diffraction grating // Thin Solid Films. Lausanne: Elsevier Science. ISSN 0040-6090. 2011, Vol. 519, iss. 12, p. 4082-4086. [Science Citation Index Expanded (Web of Science); Science Direct]. [IF (SCIE): 1,890 (2011)].

• Tamulevičius, Tomas; Šeperys, Rimas; Andrulevičius, Mindaugas; Kopustinskas, Vitoldas; Meškinis, Šarūnas; Tamulevičius, Sigitas; Mikalayeva, Valeryia; Daugelavičius, Rimantas. Application of holographic sub-wavelength diffraction gratings for monitoring of kinetics of bioprocesses // Applied Surface Science. Amsterdam: Elsevier. ISSN 0169-4332. 2012, Vol. 258, iss. 23, p. 9292-9296. [Science Citation Index Expanded (Web of Science); COMPENDEX; INSPEC; Science Direct]. [IF (SCIE): 2,112 (2012)].

- **"Micro and Nanostructures for Solid Oxide Fuel Microcells"** (2010-2011), project of the national science programme of Research Council of Lithuania

The project was carried out together with Vilnius University, Centre for Physical Sciences and Technology (FTMC).

New sol-gel methods for the preparation of yttria stabilised zirconia ceramics (YSZ) on different substrates using dip-coating technique have been developed. Formation of positive electrode–electrolyte–negative electrode (PEN) membrane of micro-solid oxide fuel cell (μ-SOFC) after deep silicon etching in tetramethylammonium hydroxide (TMAH) aqueous solution using an etch-stop layer of SiO_2 has been selected in this work. Hard, porous, electrical conductive Ni-NiO-YSZ ceramic composite coatings were formed by vacuum plasma spray method. The nickel thin films prepared by electron beam evaporation were laser drilled to form the micro-holes for the fuel cell membranes.

Publications:

• Maciulevičius, Mindaugas; Voisiat, Bogdan; Gedvilas, Mindaugas; Abakevičienė, Brigita; Tamulevičius, Sigitas; Račiukaitis, Gediminas. Evaluation of laser drilling of Ni film on silicon for solid oxide fuel cells // Journal of laser micro nanoengineering. Osaka: Japan Laser Processing Society. ISSN

1880-0688. 2011, Vol. 6, no. 3, p. 199-203. [Science Citation Index Expanded (Web of Science); Compendex]. [IF: 0,556; AIF: 3,200; IF/AIF: 0,174; Q4; 2011 Journal Citation Reports® Science Edition (Thomson Reuters, 2016)].]

• Sakaliūnienė, Jolita; Čyvienė, Jurgita; Abakevičienė, Brigita; Dudonis, Julius. Investigation of structural and optical properties of GDC thin films deposited by reactive magnetron sputtering // Acta Physica Polonica A. Warsaw: Polish Academy of Sciences. ISSN 0587-4246. 2011, Vol. 120, no. 1, p. 63-65. [Science Citation Index Expanded (Web of Science); COMPENDEX]. [IF: 0,444; AIF: 2,680; IF/AIF: 0,166; Q4; 2011 Journal Citation Reports® Science Edition (Thomson Reuters, 2016)].

• Maciulevičius, Mindaugas; Gedvilas, Mindaugas; Abakevičienė, Brigita; Tamulevičius, Sigitas; Račiukaitis, Gediminas. Evaluation of laser drilling of Ni film on silicon for solid oxide fuel cells // Physics Procedia. Amsterdam: Elsevier. ISSN 1875-3892. 2011, vol. 12, Part B, p. 317-322. [Conference Proceedings Citation Index; Science Direct].

- **"The Development of Materials Science, Nano- and Light Technology as Well as Higher Education Infrastructure in These Areas"** (2010‑2015), project funded by EU structural funds for projects of joint lasers, new materials, electronics and nanotechnology as well as applied science and technology national complex programme (NKP): (LaMeTech infrastruktūra) (No. VP2- 1.1- ŠMM- 04- V- 02- 002) and "I and II Study Cycle Modernization in Areas of Materials Science, Nano- and Light Technology" (LaMeTech studijos) (No. VP1- 2.2- ŠMM- 09- V- 01- 005)

The projects were carried out together with partners from VU, VGTU, FTMC.

New analytical and technological equipment was purchased, which was used for scientific research staff and students (additional student internships were undertaken), study programmes renewed.

Self-supporting projects

- Innovation voucher (2010); JSC PTEC, No 31V-96

Technologies suitable for fabrication of the free-standing GaN microstructures were selected. Free standing GaN on silicon structures were designed and fabricated.

- **"The Investigation and Optimization of Photolithography and Annealing Processes for the Production of THz Radiation Emitters and Detectors"** (2010), JSC Teravil

Scientific research was carried out to determine the optimal formation modes of terahertz (THz) radiation detectors and emitters electrodes with desired pattern, and to identify the main electrodes factors affecting the quality of the pattern. The outcomes showed that the THz emitters with novel and improved configuration electrodes can be successfully formed using explosive lithography. The superficial micro and macro defects on the surface of GaAs epitaxial layer had the greatest impact for the visually assessed quality of pattern of electrodes formed by explosive method. According to the research data test examples of THz emitters and detectors of novel configuration were created.

- Innovation voucher (2010) JSC Arcus Novus, No 31V-82

Possible technologies of the fabrication of the solid oxide fuel cell components were analysed. Investigations of the components of the microfuel cells were performed. Research on fabrication of the fuel cell related membrane structures was done.