AMPL-2017

PULSED LASERS AND LASER APPLICATIONS

September 10–15, 2017
Tomsk, Russia

ABSTRACTS

GENERAL SPONSOR

Special Systems. Photonics, St. Petersburg, Russia

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Institute of Atmospheric Optics SB RAS
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Institute of Monitoring of Climate and Ecological Systems SB RAS

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MEDIA SPONSORS

Atmospheric and Oceanic Optics Journal, Tomsk, Russia
Photonics Journal, Moscow, Russia

Scientific & Technical Translations
STT
PUBLISHING
Tomsk, 2017

G-2

PRESOWING IRRADIATION OF AGRICULTURAL CROPS XeCl EXCILAMP: FIELDWORK AND PERSPECTIVES

P.A. Goltsova[1,2], V.I. Gorbunkov[3], N.A. Voronkova[3], I.A. Viktorova[4], V.A. Panarin[1], D.S. Pechenicin[1], V.S. Skakun[1], E.A. Sosnin[1,2], V.F. Tarasenko[1,2], and Yu.V. Chudinova[4]

[1]High Current Electronics Institute SB RAS, 2/3 Akademicheskiy Ave., 634055 Tomsk, Russia, badik@loi.hcei.tsc.ru;
[2]Tomsk State University, 36 Lenin Ave., 634050 Tomsk, Russia;
[3]Omsk State Technical University, 11 Mira Ave., 644050 Omsk, Russia;
[4]Tomsk Agricultural Institute,19 Karl Marx Str., 634050 Tomsk, Russia, nauka_tshi@mail.ru

The effect of ultraviolet radiation of an exciplex barrier-discharge lamp on working XeCl* molecules on seeds of agricultural crops is investigated. The excilamp radiant flux falls on the wavelength range 290–320 nm (82–88%). It is shown that presowing ultraviolet treatment of seeds has a stimulating effect on the processes of intergrowth, germination and growth of plants. After processing, the seed germination power increases by 20–30%. There was also an increase in the fresh weight of the plant by 54% higher than in the control untreated samples. The root system was well developed in the treated samples. The seeds had long roots, which are closely intertwined. The obtained data formed the basis for further experiments with the upgraded irradiation facility for seed treatment process scaling.

This study was performed under state assignment of the Institute of High Current Electronics SB RAS, theme No. 13.1.3.

G-3

MECHANISMS OF THE EFFECTS OF VUV RADIATION ON THE MICROSCOPIC FUNGI CELLS

G.N. Zvereva[1,3], I.Yu. Kirtsideli[2], E.M. Machs[2], and A.I. Vangonen[3]

[1]State University of Civil Aviation, 38 Pilotov Str., 196210 St.-Petersburg, Russia, zvereva@soi.spb.ru;
[2]Botanical Institute RAS, 2 Popov Str.,197376 St.-Petersburg, Russia, microfungi@mail.ru ;
[3]State Optical Institute, Kadetskaya line-5-2, 199053 St.-Petersburg, Russia

The aim of the work was to study the effect of vacuum ultraviolet (VUV) radiation on cells of microscopic fungi (micromycetes). As radiation sources were used barrier discharge xenon excimer lamps (I = 1–2 mJ/cm^2, λ = 172 nm, P = 300 Torr). The effect was carried out on the cells of various types of micromycetes (*Aureobasidium pullulans, Cladosporium herbarum, Geomyces pannorum, Penicillium aurantiogriseum, Rhodotorula colostri*), isolated from Antarctic habitats, developed increased resistance to external influences.

Potential mechanisms of the effects of VUV radiation on the cells of micromycetes coincide with the mechanisms of action of ionizing radiation: destruction of chitin of the cell wall, the destruction of the phospholipid membrane, degradation of DNA [1]. These processes can occur both as a result of direct absorption of VUV emission quanta, and as a result of exposure to highly reactive VUV products of water photolysis and lipid oxidation products.

The change of the cell wall structure by VUV radiation was studied by IR spectrometry and atomic force (AFM) microscopy. The intensity of the IR transmission spectra of the irradiated samples increases in the bands corresponding to the absorption of proteins λ = 1313 cm^{-1},1376 cm^{-1}, 1400 cm^{-1}, and polysaccharides λ = 1454 cm^{-1}, indicating the destruction of the cell wall material. Studies on AFM indicate the absence of mechanical destruction in macromolecular scales at distances $d \geq 0.1$ μm (d- AFM resolution).

In the work a study on the effect of VUV radiation on the DNA molecule has been carried out. The results of electrophoresis indicated DNA degradation during VUV irradiation: in the irradiated samples appear low molecular weight fragments and a peak corresponding to fragments with a length of 20 000 pairs of nucleotides (Figure).