Plasma Focus – a pulsed radiation source for radiobiology studies

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ABSTRACT

Nowadays there is a revival of interest towards the plasma focus study due to some yet not studied problems of the phenomena and the growing number of applications. Quite important can be the application of the PF systems in the radiobiology. These include studies of the impact of radiation emitted by the PF discharge on live microorganisms, living cells or other biologic objects. We report the results of the influence of X-ray radiation of 3 kJ PF of Sofia University on 3 types of living organisms.

1. A study of cell viability Saccharomyces cerevisiae – (yeast) after irradiation.

The samples with the cells were irradiated by total dose of the X-ray radiation 65 mSv (determined by the TLD detectors placed upon the metal foil near the sample). No difference of the viability between the control probe and the sample was observed after irradiation. Similar results have been obtained before that with another type of yeast - Kluyveromyces marxianus, where no change of the survival activity was found after irradiation through a thick foil.

2. The irradiation of the Chlamydomonas reinhardtii samples by the X-ray emission of the PF through 20 μm Al foil with a dose of 11 mSv produces a considerable change of the photosynthesis parameters. Therefore this result is similar to the results from the previous works where strong effects of enzyme activity were derived with low doses but with a high dose power ensured by the plasma focus radiation.

3. Bioconversion of cellulose-containing substrate to glucose represents an important area of the modern biotechnology. Enzymes for the degradation of the polysaccharide part of biomass have been produced, mostly by fungi belonging to the genus Trichoderma. Trichoderma reesei M7 shows exceptionally high resistibility in respect to high doses of absorbed hard X-radiation, (mainly characteristics W Kα1 and Kα2 lines obtained using W inserts on the PF anode) with the vitality of spores practically unaltered – experiments were conducted with doses as high as 32 Sv.

The analysis of the endoglucanase activity and the measurement of the residual biomass and proteins quantities have shown that for moderate doses absorbed (200÷1200mSv) the effect of the micromycette producer is clearly expressible. We are studying whether the further increment of the dose has some measurable change of the parameters in question.

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