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Beneficiary: Maja PARDJOVSKA, Institute of Physics Belgrade
Host:Dr Marian WOLSZCZAK, Institute of Applied Radiation Chemistry
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To Whom It May Concern

# Scientific Report

***PURPOSE OF THE VISIT***

The purpose of the visit was to become familiar with application of lasers and some experimental techniques in the emission and the absorption spectroscopy. The results of this training will be helpful in the construction of the laser flash photolysis system in our laboratory. The scientific objective of my visit was to examine the role of the DNA on photoinduced electron transfer between donor and acceptor, both intercalated into duplex. This process is important because charge migration trough DNA plays the crucial role in the mutagenesis and the carcinogenesis. The experimental studies were discussed with scientists from host institution. The conclusions of this discussion are profitable for further study relevant to my PhD thesis.

***DESCRIPTION OF THE WORK CARRIED OUT DURING THE VISIT***

The experimental measurements have been performed on the following instruments: *a)* spectrofluorimeter Aminco Bowman Series2 for observation of excitation and emission spectra or for simultaneous observation of emission polarization; *b)* spectrophotometer for recording of absorption spectra in the range of 200-3300 nm (Varian Cary 5E) and in the range of 200-900 nm (Varian Cary1). Then, I conducted some experiments using two new for my techniques: flash photolysis and pulse radiolysis. Laser flash photolysis with UV or visible excitation was applied to study the yield of electron transfer products. The same setup based on Nd:YAG laser (EKSPLA, providing pulses with duration t=500 ps, λ=265, 355, 532 nm with controllable energy in the range 1 mJ – 100 mJ) was used to study kinetics of electron transfer in the nanosecond time domain. Transient absorption spectra in the longer time scale (μs-minutes) are recorded using system base on a Lambda-Physik COMPex 201 XeCl eximer laser (351 nm, pulse duration 22 ns, max. energy per pulse 300 mJ). Fluorescence time-resolved measurements were conducted using set-up based on nitrogen laser (PTI, 337 nm, pulse duration 800 ps, E=1.5 mJ) or Nd:YAG laser (EKSMA,1064nm, pulse duration 22 ps, E=35 mJ) coupled with dye laser or with Nd:YAG laser (EKSPLA). Pulse

radiolysis technique was used to study the properties of the reactive forms of drugs applied in Photo-Dynamic Therapy (PDT).

## *DESCRIPTION OF THE MAIN RESULTS OBTAINED*

The first measurement conducted by us was quenching of DNA bound intercalator – ethidium bromide (EtBr) by two quenchers, both intercalators: AMAC (9-aminomethylanthracene chloride) and PBTMA (1-pyrenebutyltrimethylammonium bromide). Absorption spectrum of EtBr in aqueous solution was changed when DNA is added. The maximum of absorption spectrum in the presence of DNA was red shifted (from 475 nm to 525 nm) and intensity of main absorption band was lower. The intensity of EtBr fluorescence in the DNA solution was about 12 times stronger with respect to that recorded in aqueous solution. In the presence of AMAC the fluorescence of EtBr was partially quenched when both were intercalated into DNA.

The results obtained by laser flash photolysis experiment are related to the triplet absorption. Life- time of T-T absorption spectrum of AMAC in the deairated aqueous solution is 100 μs, and in the presence of air is equal to 2 μs. The rate constant for the quenching of triplet state of AMAC by oxygen, calculated form Stern-Volmer plot is equal to $2 \bullet 10^9$ $dm^3mol^{-1}s^{-1}$. The flash photolysis experiments have shown that the electron is transferred from the triplet state of AMAC to methylviologen producing the cation radical of it.

Using pulse radiolysis (electron pulse duration of 17 ns, dose 60 kGy) the reduction of AMAC in aqueous solution was studied.

## *FUTURE COLLABORATION WITH HOST INSTITUTIONS*

The future collaboration with host institution will involve further investigation concerning the DNA damage induced by light and ionizing radiation in the presence of the molecules used as drugs in radio- and photodynamic therapy.

## *PROJECTED PUBLICATIONS/ARTICLES RESULTING OR TO RESULT FROM THE STSM*

Most of preliminary results that are obtained during this Short Term Scientific Mission will be used for further collaboration with host institution. We are planning the next STSM on May 2005.

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