

Scientific Report, COST P9 Action

The STSM of Justyna Staluszka in the Institute of General, Inorganic and Theoretical Chemistry at Innsbruck University, 14-26 February, 2005.

According to the plan of my visit, I have discussed the recent results of our joint research with the co-authors from Innsbruck, and participated in preparation of the hyperquenched glassy water (HGW) samples for the future studies.

In particular, we have discussed in details a first draft of the paper *Radicals Produced by γ Irradiation of Hyperquenched Glassy Water Containing 2'-Deoxyguanosine-5'-monophosphate* by Justyna Staluszka, Ewa Szajdzinska-Pietek (Technical University of Lodz), Ingrid Kohl, Christoph G. Salzmann, Andreas Hallbrucker, Erwin Mayer (University of Innsbruck). The objectives of this work were to identify paramagnetic species trapped at 77 K, to assess their thermal stability, and to compare the results with those reported for irradiated guanine derivatives in other matrices. After some modifications and completing the conclusions, the manuscript will be submitted to *Radiation Research* or *Radiation Physics and Chemistry*.

Within the experimental part of my visit, I have managed to prepare four HGW samples doped with 2'-deoxyguanosine-5'-monophosphate (dGMP) or $K_3Fe(CN)_6$ (electron scavenger), and three samples of neat HGW. The latter were obtained by a method different from that used previously: the airbrush was used instead of the ultrasonic nebulizer for preparing water aerosol. These samples contain a significant fraction of a crystalline phase (up to 50%, as compared to ~95% with the use of nebulizer). It will be important, however, to check whether HO_2 radicals can be observed after γ -irradiation at 77. This result would definitely confirm the proposed mechanism of formation of these species in HGW (Bednarek *et al.*, *J. Am. Chem. Soc.* **1996**, *118*, 9387-9390), and refute an alternative explanation that they can be formed due to H-atom reaction with oxygen produced by sonolysis of water aerosol.

To assess the content of a crystalline phase (cubic and/or hexagonal ice) in the obtained samples I have performed some experiments using the differential scanning calorimetry (DSC) and X-ray diffraction methods. These experiments revealed that the new facility, installed recently in the Innsbruck Laboratory, requires some modification of experimental parameters (especially, the time in which water aerosol is allowed to condense to a glass),

compared to the previous ones, to obtain the samples of good quality (95% content of the amorphous phase).

In conclusion, during this STSM I learned the methods used in the Innsbruck Laboratory, prepared some samples to be examined in Lodz, and, most importantly, discussed details of the forthcoming joint publication.

The collaboration between our research group in Lodz and the group of Prof. Erwin Mayer at Innsbruck University will be further developed at least in the next few years. Our immediate objective is to identify primary radiation-produced species in the HGW matrices doped with other DNA constituents. The benchmark ESR spectra of the radicals observed in these simple systems will be then used to analyse the results obtained for the DNA itself. Our studies should contribute to a better understanding of the indirect radiation effects on biomolecules.

Lodz, 7.03.2005

