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Main topics
of research and
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separation methods
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radiobiology
radiation safety

radiation technologies
for medicine, industry
and protection
of environment

nuclear instrumentation

nuclear techniques
in material and
process engineering

Scientific report about Chantal Houée-Levin's stay in Professor K. Bobrowski's laboratory January 17th to 25th 2005

The purpose of the stay was the study of radiation - induced degradations in two amino acids, asparagine and aspartic acid. These amino acid are known to be degraded by free radicals in vivo, which leads to numerous troubles such as cataract.

The advantage of the stay was the possibility to use EPR spectroscopy to elucidate the nature of the free radicals formed and their stability. In the French group there is not the possibility to use such device. In addition it gave the opportunity to benefit of the experience of the Polish group. Samples of each amino acid in microcrystalline form were irradiated by gamma rays and EPR spectra were recorded as a function of temperature between 77K up to room temperature. The spectra were then simulated making hypotheses on the nature of the free radicals. For both amino acids, below 100K, one sees only the radical anions coming from electron localization. Upon warming, the decarboxylated radicals appear, however the amount is higher for aspartic acid than for asparagin. The anion disappears upon warming and radical dehydrogenated on β position appear in big quantity. At room temperature, asparagin undergoes deamidation.

In addition, the French group performed calculation by DFT methods on the stability of possible free radicals coming from these two amino acids. Results were compared with the experimental ones. The radical anion of asparagine ejects H atom from the amine group, which does not take place from aspartic acid radical anion. In both radical cations the C-C bond linking carboxylate group is weakened, indicating that decarboxylation comes from the radical cation. Liberation of hydrogen atoms could lead to dehydrogenated radical at position β . Thus there is a good agreement between calculations and experiments. Some mechanisms of formation and decay of free radicals could be deduced, which was the aim of the stay. An article is being written and will be submitted soon.

In addition to this main purpose, Chantal Houée-Lévin had the possibility to visit the pulse radiolysis set up. Several common projects between the two groups are realized (oxidation of peptides related to enkephalins and to β amyloid peptide) and there was also the possibility to discuss some recent results obtained by the Polish group.

Thus generally speaking, the aims of this visit were attained and the link between both groups were strengthened. This will lead to future collaborations.

Warsaw, January 24th,