Investigation of hyperfine interactions in DNA nitrogenous bases using perturbed angular correlation spectroscopy

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Perturbed $\gamma\gamma$ angular correlations (PAC) spectroscopy has been used to study the DNA nitrogenous bases (adenine, cytosine, guanine, thymine), using $^{111}In \rightarrow ^{111}Cd$ and $^{111m}Cd \rightarrow ^{111}Cd$ probe nuclei. One of the advantages of applying PAC technique to biological molecules is that the experiments can be carried out on molecules in aqueous solution [1], approaching the function of molecules under conditions that are close to in vivo conditions. The measurements were carried out for DNA nitrogenous bases molecules at 295 K and 77 K in order to investigate dynamic and static hyperfine interactions, respectively. The interpretation of the results was based on the measurements of dynamic interaction characterized by the decay constant (λ) from which valuable information on the macroscopic behavior of the molecules were obtained [2, 3]. On the other hand, PAC measurements at low temperature showed interaction frequency (ν_Q), asymmetry parameter (η) and the distribution of the quadrupole frequency (δ). These parameters provide a local microscopic description of the chemical environment in the neighborhood of the probe nuclei. Results showed differences in the hyperfine interactions of probe nuclei bound to the studied biomolecules. Such differences were observed by variations in the hyperfine parameters, which depended on the type of biomolecule and the results also showed that the probe nuclei bounded at the molecules in some cases and at others did not.

References

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