Investigation of electron transfer in proteins monitored by μSR

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The electron-transfer process plays an important role in life science. The μSR studies of hemoproteins and DNA [1] found to detect sensitively the facts that electron brought-in by the μ^+ localizes to form a radical state and/or diffuses rapidly along intra-molecular chains and/or inter-molecular paths by the help of Risch-Kehr (R-K) theory [2]. In order to understand the electron-transfer process in proteins, we are investigating μSR experiments on proteins [3].

The μSR measurements of oxidized form of cytochrome *c* of horse heart together with hen egg white lysozyme as a reference protein were carried out at RIKEN-RAL and at J-PARC MUSE. Cytochrome *c* is one of the members of respiratory chain in mitochondria. The B_{ext} dependence of the longitudinal relaxation parameter (Γ) was measured in the region from 0 G to 4000 G. In the high field region, Γ showed an inverse dependence on B_{ext}, and it was suggested that the one-dimensional electron movement occurred. On the other hand, no field dependence was observed at the low field. There, three dimensional electron movements would occur. The boundary field of the wet sample was higher than that of the dry sample. There are no significant difference between H_2O and D_2O. In addition, the latter effect was suppressed below 200 K, which would reflect the effect of the glass transition.

References

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