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Biological Applications of Perturbed Angular Correlations of γ-Ray Spectroscopy

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Perturbed angular correlation of γ-rays (PAC) spectroscopy is a techinque routinely used in solid state physics, however, it has also proved to be a method that allows for studies of biological problems, such as local structure at metal ion binding sites, dynamics of protein folding or protein–protein interactions [1].
In this work we illustrate that PAC spectroscopy is a suitable tool to investigate HAH1 binding properties towards Hg(II) in a wide pH and temperature range. Our findings show that HAH1 interaction with Hg(II) may reflect metal ion transfer between proteins via formation of HgS4 species [2]. We have also shown that by using PAC it is possible to monitor the metal ion coordination chemistry in metallothionein MT3, a metal-binding protein which plays a protective role against heavy-metal poisoning and is also related to Alzheimer' s disease [3]. Until now functions and metal components of MT3 have not been fully examined and therefore the studies undertaken may significantly contribute to the recent findings on MT3 and might provide a better uderstanding of physiological role of this protein. Moreover, the in vivo experiments using 199mHg-PAC spectroscopy clearly show that this technique is capable of providing (surprisingly good) experimental data even in very complex systems.
In addition, several PAC experiments on 199mHg small model complexes have also been performed in order to determine the unknown partial NQIs for many important biological ligands coordinated to this metal ion, such as sulfur, nitrogen or oxygen.

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