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## **OPENING LECTURE - Iron speciation in aqueous systems: the power of Mössbauer spectroscopy applied in frozen solutions**

*Tuesday 18 September 2012 11:50 (20 minutes)*

Mössbauer Spectroscopy is technique basically used for the analysis of solid systems due to the necessity of recoilless gamma emission and absorption.  $^{57}\text{Fe}$  offers very convenient conditions for Mössbauer measurements, and this is why iron containing systems ranging from alloys to minerals have been studied and reported in thousands of scientific papers, and Mössbauer Spectroscopy became a popular and powerful method.

Aqueous solutions of iron salts can only be studied in frozen state, which poses some experimental challenge, but this opens a new window to systems otherwise difficult to analyse.

Structure of solvated ions, species participating in complex equilibria, and numerous other problems can be solved by quick freezing of the solution studied.

The technique has been applied first by Attila Vertes in the late 1960s, and most common iron salts (nitrate, perchlorate, sulfate, chloride, etc.) have been thoroughly investigated.

Beyond the regular Mossbauer parameters, in solutions, paramagnetic spin relaxation can help distinguish between various species especially between monomeric species and possible bridged dimers or oligomers. Evaluation of Mössbauer parameters can reveal oxidation states, coordination numbers, possible isomers of multi-ligand complex ions, contribution of the solvent molecules in the ligand sphere, etc.

The method how one can use frozen solution Mossbauer spectra to identify iron species in aqueous solutions will be demonstrated with special focus on iron chelates and their reactions with hydrogen peroxide resulting in the formation of peroxy adducts.

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**Track Classification:** Reaction mechanisms and nuclear recoils, nuclear based spectroscopies (MOSSPEC and PAS), radiation geochronology, isotope effects