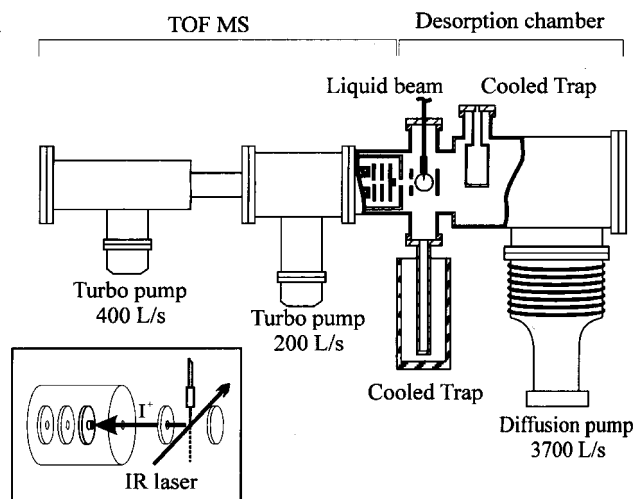


Analytical laser induced liquid beam desorption mass spectrometry
of biomolecules and their aggregates

I accomplished my project week in the group of Prof. Dr. Bernd Abel at the Max-Planck-Institut für Biophysikalische Chemie. The goal was to be introduced to the rather new technique of analytical laser induced liquid beam desorption mass spectrometry. With this technique it is possible to desorb pre-formed ions directly from the liquid phase and to analyze them in a time-of-flight mass spectrometer. To achieve this, a microscopic liquid beam is injected into a high vacuum chamber and irradiated with pulses of an infrared laser beam.

Schematic diagram of the experimental apparatus:

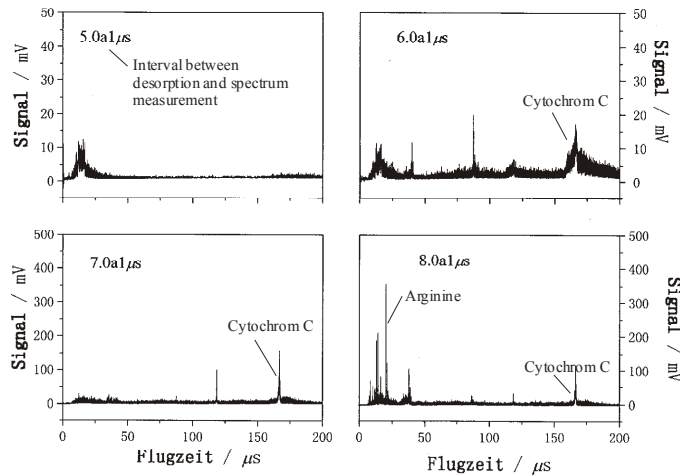


This method allows ions to be desorbed directly from the liquid phase into the high-vacuum region of a mass spectrometer to detect non covalent protein-protein complexes.

My project was divided into two parts. The first part was to compare the standard biomolecule cytochrome C with the amino acid arginine regarding velocities and the second part was to investigate and analyse the non covalent complex of human haemoglobin.

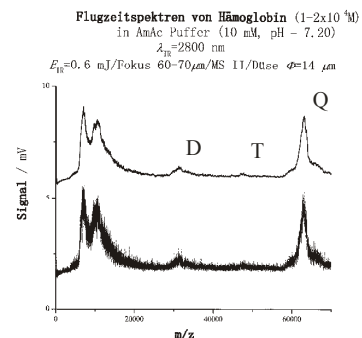
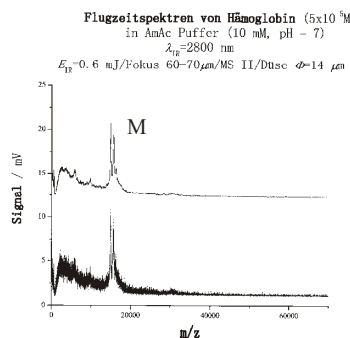
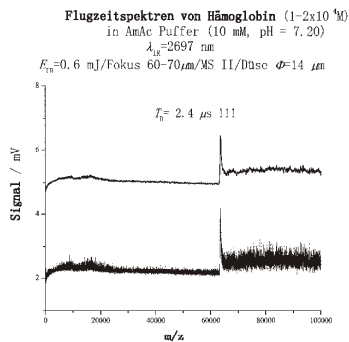
Spectra of the mixture of cytochrome C and arginine:

Flugzeitspektren von Cytochrome C & Arginin
 in H₂O (1x10⁻⁴M & 1x10⁻³M, pH = 7.10)
 $\lambda_{IR}=2800$ nm
 $E_{IR}=0.6-0.7$ mJ/Fokus 60-70 μ m/MS II/Düse $\Phi=14$ μ m



The spectra were measured after different intervals between desorption and spectrum measurement. First cytochrome C was detected meaning that the large biomolecule cytochrome C obtains higher velocity after desorption than the small molecule arginine. This phenomenon needs to be explained in the future.

Spectra of human haemoglobin:



With a good focussed laser beam only monomer could be detected. Too much energy was allocated to maintain any complexes. Energy reduction was performed through defocussation to obtain peaks for the dimer, the trimer and a big peak for the tetramer, but no peak for the monomer.

Comparing spectra with different intervals between desorption and spectrum measurement does not make sense, because with reduction of energy the conditions were changed. Another phenomenon that can not be explained at the moment is that

tetrameric complexes were not just seen after about 8 μ s but also after an extremely short time of 2.4 μ s and with a very good resolution.