

Imaging small (bio)molecules in action

Jolijn Onvlee

Controlled Molecule Imaging (CMI), Center for Free-Electron Laser Science (CFEL),
Deutsches Elektronen-Synchrotron (DESY), Notkestraße 85, 22607 Hamburg, Germany

Atomic and molecular properties strongly depend on the environment. For a protein in an aqueous environment, for instance, hydrogen bonds between the protein and surrounding water molecules strongly affect its folding and thereby also its function. When hydrogen bonds between a protein and surrounding water molecules break, for instance *via* absorption of UV radiation, the protein structure changes and inactivation of the protein can occur. The amino acid tryptophan plays an important role in the UV inactivation of proteins, since it is the most strongly near-UV absorbing common amino acid.

We investigated the ultrafast dynamics of the hydrogen-bond breaking between proteins and water in a bottom-up approach by studying the indole molecule – the chromophore of tryptophan – and the indole-water complex, which serves as a model system for the interaction between proteins and water. We used a molecular beam in combination with a Stark deflector to create pure indole and indole-water samples. In this talk, I will show how we used these pure samples to study the ultrafast hydrogen-bond and excited-state dynamics in these systems. I will moreover show how we can use laser-induced electron diffraction to study complex molecules such as indole and indole-water.

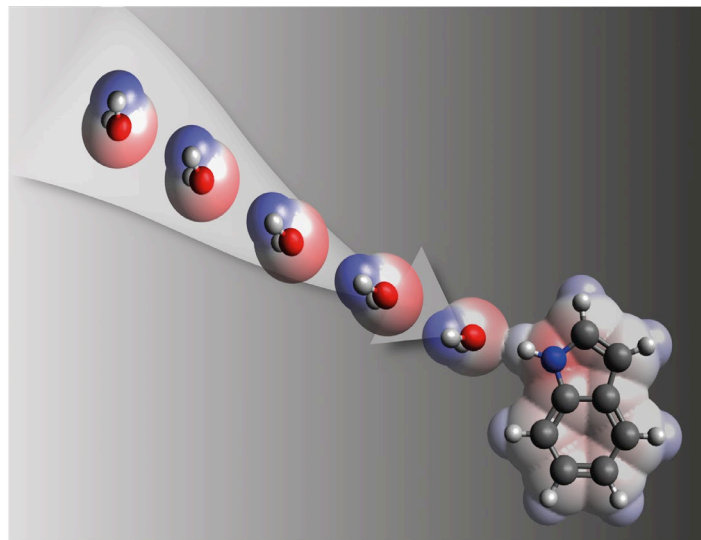


Illustration of the hydrogen-bond formation in indole-water