CONFORMER-SPECIFIC IR SPECTROSCOPY OF LASER-DESORBED SULFONAMIDE DRUGS: TAUTOMERIC AND CONFORMATIONAL PREFERENCES OF SULFANILAMIDE AND ITS DERIVATIVES

THOMAS UHLEMANN, SEBASTIAN SEIDEL, CHRISTIAN W. MÜLLER, *Physikalische Chemie II, Ruhr University Bochum, Bochum, Germany*.

Molecules containing the sulfonamide group $\mathrm{R^1}$-$\mathrm{SO_2}$-$\mathrm{NHR^2}$ have a longstanding history as antimicrobial agents. Even though nowadays they are not commonly used in treating humans anymore, they continue to be studied as effective inhibitors of metalloenzyme carbonic anhydrases. These enzymes are important targets for a variety of diseases, such as, for instance, breast cancer, glaucoma, and obesity. Here we present the results of our laser desorption single-conformation UV and IR study of sulfanilamide ($\mathrm{NH_2}$Ph-$\mathrm{SO_2}$-NHR, R=H), a variety of singly substituted derivatives, and their monohydrated complexes. Depending on the substituent, the sulfonamide group can either adopt an amino or an imino tautomeric form. The form prevalent in the crystal is not necessarily also the tautomeric form we identified in the molecular beam after laser desorbing the sample. Furthermore, we explored the effect of complexation with a single water molecule on the tautomeric and conformational preferences of the sulfonamides. Our conformer-specific IR spectra in the NH and OH stretch region (3200–3750 $\mathrm{cm^{-1}}$) suggest that the intra- and intermolecular interactions governing the structures of the monomers and water complexes are surprisingly diverse. We have undertaken both Quantum Theory of Atoms in Molecules (QTAIM) and Interacting Quantum Atoms (IQA) analyses of calculated electron densities to quantitatively characterize the nature and strengths of the intra- and intermolecular interactions prevalent in the monomer and water complex structures.