SUPERSONIC JET INFRARED SPECTROSCOPY OF MOLECULAR HANDSHAKES

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The interaction between pairs of chiral objects such as hands depends on their relative handedness. Pairs of right (or left) hands match better than mixed left/right pairs, and if we enforce the latter, the grip will be a rather different one. Obviously, this macroscopic experience has its counterpart at the molecular level. A molecular dimer built from two identical copies of a chiral molecule will differ from one which is built from mutual mirror copies. One way to detect this phenomenon of chiral self-recognition is via infrared spectroscopy of supersonic jets. Ragout-jet FTIR spectroscopy [a] provides the necessary sensitivity. It allows for the study of small prototype systems, which are also accessible to high level quantum chemistry treatments. Results on glycidol dimer [b] and related systems are presented. They provide unambiguous spectral evidence of chiral self-recognition. The spectra are discussed in terms of conformational flexibility and hydrogen bond topology. An outlook on molecular self-organization in larger aggregates is given.

[a] T. Häber, U. Schmitt, C. Emmeluth, M.A. Suhm, Faraday Discuss. 118 (2001) 331

[b] N. Borho, T. Häber, M.A. Suhm, Phys. Chem. Chem. Phys. 3 (2001) 1945