Molecular Recognition of Cyclohexanes Derivatives by Alleno-Acetylenic Cages

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Monosubstituted and *trans*-1,2-disubstituted cyclohexane derivatives can be selectively cocrystallized in a (di)axial conformation within alleno-acetylenic cage receptors [1,2]. Remarkably, the dihedral angle between the two axial substituents shows a substantial deviation (by up to 40°) from an idealized dihedral angle of 180°. Similarly large deviations from the idealized dihedral angle were detected in theoretically optimized *isolated* cyclohexane derivatives. A comparison of these structures to structures of cyclohexane derivatives optimized within the receptor revealed that encapsulation hardly affects the structure of the guest molecules. The electron densities of the host-guest complexes were qualitatively analyzed [3] to uncover the nature of the interactions between the guest and the host. The analysis revealed that no major steric clashes between the guest and the receptor are present, further illustrating the perfect shape complementarity between the ensemble. The guest instead exhibits allover enveloping dispersive interactions with the receptor. Mono- and dihalocyclohexanes additionally exhibit halogen bonding interactions to the receptors. A recent study by Riley *et al.* [4] revealed that C-X···π interactions such as those present between the guest and the resorcine[4]arene core of the receptor have low geometrical requirements. We additionally studied the geometrical requirements of C-X···||| interactions to quantify the strength of the halogen bonding interactions between the guest and the alleno-acetylenic arms of the receptor. The arrangement of the halocyclohexanes within the receptor allows for a significant amount of halogen bonding to the resorcine[4]arene core as well as to the alleno acetylenic arms of the receptors. Hereby, the halogen bond strength decreases with the atomic number of the halogen substituent. Altogether, this study presents the first example of a chiral recognition study purely based on weak halogen bonding and dispersive interactions between the guest and the receptor.

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