

Solution-Phase Applications of Halogen Bonding: Anion Recognition and Templated Self-Assembly

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Interlocked molecules have captured chemists' imagination owing to their non-trivial topology and promising potential as molecular machines and chemical sensors.¹ The synthesis of such sophisticated architectures is a challenge and requires the implementation of imaginative templation strategies. These synthetic methodologies typically employ a combination of complementary Lewis acid–base, electrostatic, and hydrogen-bonding interactions for component assembly.² Halogen bonding (XB) is the attractive, highly directional, non-covalent interaction between an electron-deficient halogen atom and a Lewis base,³ and the scope of XB in solid-state crystal engineering has been intensively explored for a number of years. In spite of the complementary analogy to ubiquitous hydrogen bonding, however, it is only recently that investigations into the use of solution-phase XB interactions for molecular recognition, self-assembly and catalysis has resulted in this field developing rapidly.⁴ Indeed, in conjunction with anion templation, we have used XB to assemble interpenetrated and interlocked molecular frameworks.⁵ By incorporating a suitable neutral Lewis base XB acceptor, such as pyridine, into a macrocyclic framework, we have also demonstrated that a single charge-assisted XB interaction can be utilized for the templation of a pseudorotaxane assembly and, importantly, in the synthesis of a novel interlocked catenane according to the synthetic strategy outlined in Figure 1.⁶

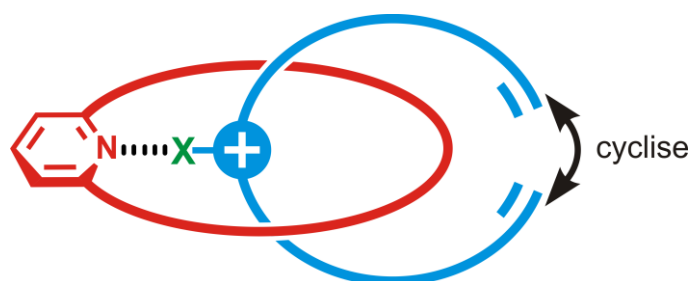


Figure 1: Cartoon representation of halogen-bond-templated pseudorotaxane species (X is a halogen atom).

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